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The Marine Shells of the West Coast of North America

VOL. I

BY

IDA SHEPARD OLDROYD

Curator of the Geological Museum

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CONTENTS

	PAGE
Introduction	5
Range of Species	7
Description of Species	9
Bibliography	233
Index	237
Plates and Explanation of Plates	249

INTRODUCTION

The purpose of this work is to bring together the marine shells of the west coast of North America from the Arctic Ocean to San Diego, giving the original description, whereabouts of the type and type locality, geographical and geological range. The writer has been engaged continuously for eight years in the preparation of this work, in the museum at Stanford University and in the field from Puget Sound to San Diego; and has made four journeys to compare material in the eastern museums: the United States National Museum, the Philadelphia Academy and the American Museum of Natural History in New York. To the authorities of these institutions the writer wishes to express her thanks for generous assistance. In this work are figured all common species of marine mollusca of the Californian province, a great many being figured for the first time. When figures are not given, full references are made where figures may be seen in papers easily accessible. It is the purpose of the writer to make this work useful to the amateur as well as to the professional conchologist.

Acknowledgments are due to Dr. W. H. Dall, of the United States National Museum, for his help in identification and classification of specimens and for kindly criticism; to Dr. Paul Bartsch, of the same institution, for identification of minute, and descriptions of new species; to Mr. T. S. Oldroyd for assistance in field and laboratory; to Dr. C. F. Newcombe, Victoria, British Columbia, for specimens; to Dr. C. McLean Fraser of the Dominion Station at Nanaimo, British Columbia, for use of material; to Dr. J. P. Smith, of Stanford University, for supervision of the preparation of this work; to Professor Trevor Kincaid, of the University of Washington, for contribution of specimens collected by him; to Mr. A. Taylor, Vancouver, British Columbia, for donation of specimens used in the preparation of this paper; to Dr. T. C. Frye, of the University of Washington, for material dredged in Puget Sound; to Dr. B. L. Clark, of the University of California, for specimens and use of plates; to Stanford University, for financial aid in furnishing plates for illustration and for publication of this work.

The line or lines preceding the description give the reference to the original description and the place where the species is figured.

RANGE OF SPECIES

CIRCUMBOREAL SPECIES

Arca reticulata
Astarte fabula
Astarte globosa
Astarte polaris
Cuspidaria glacilis
Cyrtodaria kurriana
Gemma gemma
Kellia suborbicularis
Lasea rubra
Leda arctica
Leda buccata
Leda glacialis
Leda minuta
Leda pernula
Lima suborbiculata
Lyonsia striata
Macoma balthica
Macoma calcarea
Modiolaria corrugata
Modiolaria nigra
Modiolus modiolus
Mytilus edulis
Mya arenaria
Mya truncata
Nucula tenuis
Pandora glacialis
Pecten islandicus
Saxicava arctica
Saxicava pholadis
Serripes gronlandicus
Thyasira gouldi
Thyasira ferruginosa
Thyasira polygona
Thyasira trisinuata
Turtonia minuta
Yoldia intermedia
Yoldia limatula
Yoldia thraciæformis
Yoldia siliqua

RANGE TO THE GULF OF CALIFORNIA

Amiantis callosa
Asthenothærus villosior
Bankia setacea
Botula diegensis
Cardium eudoxia
Cardium procerum
Cardium substriatum
Chione fluctifraga
Cooperella subdiaphana
Corbula fragilis
Cryptomya californica
Cyrilla minuta
Diplodonta orbella
Donax gouldi
Donax punctatostriata
Ensis californicus
Glycymeris migueliana
Glycymeris multicostata
Leda acuta
Leda oxia
Lima dehiscens
Lucina edentuloides
Mactra dolabriformis
Mactra planulata
Martesia intercalata
Modiolus opifex
Nucula exigua
Nucula linki
Ostrea lurida
Ostrea palmula
Pandora granulata
Pecten æquisulcatus
Pecten randolphi
Phacoides approximatus
Phacoides nuttallii
Phacoides richthofeni
Psammobia regularis
Pseudopythina compressa
Semele pacifica
Semele rupicola
Septifer bifurcatus
Solemya valvulus
Solen rosaceus
Sphenia fragilis
Tellina bodegensis
Tellina buttoni
Tellina carpenteri
Tellina lamellata
Tindaria mexicana
Xylophaga mexicana

RANGE TO PANAMA

Anatina undulata
Arca nucleator
Arca solida
Antigona fordi
Cardium biangulatum
Chama buddiana
Chione succincta
Corbula obesa
Corbula porcella
Crassinella branneri
Crenella divaricata
Cuspidaria apodema
Cuspidaria beringensis
Cuspidaria pectinata
Diplodonta subquadrata
Diplodonta serricata
Donax californica
Dosinia ponderosa
Heterodonax bimaculata
Kellia suborbicularis
Leda hamata

RANGE TO PANAMA (Continued)

Martesia xylophaga
Mytilus adamsianus
Ostrea veatchii
Chama exogyra
Pteria sterna
Saxicava arctica
Saxicava pholadis
Sphenia truncula
Semele striosa
Solemya johnsoni
Tagelus affinis
Tagelus subteres
Tellina declivis
Tellina panamensis
Verticordia ornata

RANGE TO PERU AND GALÁPAGOS ISLANDS

Anomia peruviana
Arca pompholyx
Arca reticulata
Cardium elatum
Cardium procerum
Chama frondosa
Chama pellucida
Chione undatella
Cumingia lamellosa
Divaricella perparvula
Donax conradi
Lasæa rubra
Leda pontonia
Lithophaga aristata
Lithophaga attenuata
Lithophaga plumula
Lyonsia inflata
Modiolus capax
Pecten circularis
Pedalion chemnitzianum
Periploma planiuscula
Petricola denticulata
Semele pulchra
Solemya agassizii

RANGE TO JAPAN

Botula californica
Cardium ciliatum
Cardium corbis
Macoma calcarea
Macoma incongrua
Macoma secta
Paphia staminea
Pecten alaskensis
Psammobia californica
Pododesmus macroschisma
Serripes gronlandicus
Spisula alaskana
Spisula voyi

CLASS PELECYPODA

Family SOLEMYACIDÆ.

Genus **SOLEMYA** Lamarck, 1818.

Shell elongated, cylindrical, gaping at each end; epidermis dark, horny, extending beyond the margins; umbones posterior; hinge edentulous; ligament concealed; pallial line obscure. Outer layer of long prismatic cells, nearly parallel with the surface and mingled with dark cells, as in *Pinna;* inner layer also cellular. (Tryon. S. S. Conch.)

TYPE. *Solemya togata* Poli. Mediterranean.

DISTRIBUTION. United States, Canaries, West Africa, Mediterranean, Australia, New Zealand; burrowing in mud.

Subgenus ACHARAX Dall, 1891.

Solemya johnsoni Dall, 1891.

Plate 14, fig. 1.

Proc. U. S. N. M., **14**:189 and **17**; pl. 25, fig. 1.

Shell resembling *S. macrodactyla* Mabille and Rochebrune, from Orange Harbor, Tierra del Fuego, but larger, longer in proportion, the shorter end more tapering and the opposite end more rounded. Length of shell 115, height 48, diameter 18, mm. The cartilage pit is 30 mm. behind the shorter end, and the greatest length of the digitate epidermis beyond the edge of the shelly valve is 23 mm. (Dall).

TYPE in U. S. N. M., No. 106886. Type locality, U. S. steamer Albatross station 3010, off the coast of Lower California, in 1005 fathoms.

RANGE. Oregon to Panama.

Solemya agassizii Dall, 1908.

Plate 40, fig. 11.

Bull. of Comparative Zoology, **43**:365; pl. 16, fig. 10.

Shell large, elongated, heavy, chalky, with a strong blackish periostracum which, except near the middle of the base, is produced into long ragged processes beyond the margin of the valve; the surface of the valve is radially channelled with wide, deep channels which are reflected by prominent ribs on the inner surface of the valves; it is the portion of the periostracum which lies in the channels which forms the processes, and which covers the interspaces which fails to retain its continuity

except for a short distance beyond the edge of the valves; valves very inequilateral, posterior end very short, hinge line nearly straight, the sulcus for the ligament nearly parallel with the hinge line, and nymph inconspicuous so that on a casual glance one might suppose there was none; beaks not raised; the hinge line below them thickened and flat, radially striated; anterior hinge line straight, thin; valves widest at the anterior part of the valve with 6 or 7 strong radial channels, the interspaces wider and often with margins a little raised or with slightly elevated border; beyond the channelled area there are a few faint radial furrows and a perfectly smooth unfurrowed space in the middle of the valve; posterior slope straight, furrow for the ligament long, deep and wholly external; there is a wide triangular smooth space, in front of which are five or six channels radiating to the margin, much more shallow than those at the anterior end and defined chiefly by shallow furrows at each side of the obsolete channel and the raised margins of the wide interspaces; interior chalky, the anterior muscular impression feeble, the posterior stronger and ovate: Length of the valve, excluding periostracum, about 95; height, 30; and diameter, 25 mm. The species reaches a length of more than 150 mm. (Dall).

TYPE in U. S. N. M. No. 106885. Type locality, U. S. S. Albatross station 3360, Gulf of Panama, in 1672 fathoms, sand.

RANGE. Tillamook, Oregon, to Aguja Point, Peru.

Subgenus PETRASMA Dall, 1908.

Solemya panamensis Dall, 1908.

Plate 9, fig. 4.

Bull. of Comparative Zoology, **43**:365.

Shell thin, elongate-oval, the posterior end more pointedly, and the anterior end more bluntly, rounded; periostracum brown, brilliantly polished, recurved on the margins of the valves, not produced into long processes, though more or less broken up outside of the margins; anterior part of the shell radiately marked with 8 or 9 obscure rays, which are more crowded in front and dorsally; the middle of the valve with sparse rays, the posterior part having 6 or 7 more closely adjacent, followed by a smooth unradiated area behind the beaks and above a line drawn from them to the middle of the posterior end of the valve; beaks flat, with a lozenge shaped area of ligament visible behind them; interior bluish, translucent; the chondrophore strong, projecting obliquely backward in front of the posterior adductor scar; muscular impression rather obscure; interior of the valves faintly radiately striated. Length of valve exclusive of the periostracum, 39; height, 150; diameter, 8; the beaks in front of the posterior end 14 mm. (Dall).

TYPE in U. S. N. M. No. 110679. Type locality, U. S. S. Albatross station 2799, Panama Bay, in 29 fathoms.

RANGE. Santa Barbara, California, to Panama.

Solemya valvulus Carpenter, 1864.

Plate 40, fig. 10.

Ann. and Mag. Nat. History, (3) 13:312.

S. testa minore, tenuissima, diaphana, vix testacea, cornea, pallidiore, lineis tenuibus, distantibus, fuscis, radiatum ornata; postice tenuiter radiatim striata; tumente, satis elongata, marginibus antico et postico regulariter excurvatis; umbonibus vix conspicuis; lineis anticis divaricantibus, extus parentibus, intus lacunam cartilagineam definientibus; cardine edentulo; ligamento, antice curto, latiore bifurcato; cicatricubus adductorum subrotundatis. (Carpenter.)

Shell small, thin, transparent, scarcely or hardly shelly, pale horn color, ornamented radially with slender distant brownish lines; finely striate radially in the rear; tumid, somewhat elongate, with markings in front and rear regularly curved; with inconspicuous umbones; with lines branching anteriorly, purple outside and inside, defining the cartilage pit; with edentulous hinge; with ligament elongate to the rear, anteriorly short broad bifurcate; adductor scars subrotundate. (A free translation.) Length, 85; height, 25 mm.

TYPE in U. S. N. M. Type locality, Cape San Lucas, Lower California.

RANGE. San Pedro, California, to the Gulf of California.

Family NUCULIDÆ.

Genus **NUCULA** Lamarck, 1799.

Shell trigonal, with the umbones turned toward the short posterior side; smooth or sculptured, epidermis olive, interior pearly, margins crenulated; hinge with prominent internal cartilage pit, and a series of sharp teeth on each side; pallial line simple. (Tryon. S. S. Conch.)

TYPE. *Nucula obliqua* Lamarck.

DISTRIBUTION. Northern and Arctic seas; Siberia, Melville Is., New England, Britain, Mediterranean, Cape, Japan, Australia.

RANGE IN TIME. Palæozoic, Trias, Cretaceous and Tertiary.

Nucula quirica Dall, 1916.

Proc. U. S. N. M., 52:394.

Shell small, dark olive inclining to black, polished, with rather rude irregular incremental lines; rounded triangular, the anterior end very

short; valves inflated, with seven anterior and twelve posterior hinge teeth, the resilifer narrow, elongated, very oblique, almost parallel with the posterior dorsal margin, hardly projecting inner margin of the valves entire; beaks prominent showing the prodissoconch, lunule obscure. Length, 8; height, 6; diameter, 3.5 mm. (Dall.)

TYPE in U. S. N. M. No. 208727. Type locality Chugachik Bay, Cooks Inlet, Alaska, in 60 fathoms.

RANGE. Chugachik Bay, Cooks Inlet, Alaska.

Nucula petriola Dall, 1916.

Proc. U. S. N. M., **52**:395.

Shell minute, ovate, inflated, the form resembling *Crenalla columbiana,* the prodissoconch visible on the rather inflated beaks; lunule obscure; color greenish olive, smooth and polished; valve margins smooth, hinge line very short. Length, 125; height, 2; diameter, 1.5 mm. (Dall.)

TYPE in U. S. N. M. No. 271416. Type locality, off Santa Rosa Island, California, in 53 fathoms, mud.

RANGE. Known only from type locality.

Nucula linki Dall, 1916.

Proc. U. S. N. M., **52**:394.

Shell small, inflated, smooth, dark olive, very inequilateral, subtriangular, the anterior end shorter; lunule large, bounded by a faint keel; beaks prominent showing the whitish prodissoconch; six anterior and eleven posterior hinge teeth; valve-margin entire; the resilifer small, deeply set, subumbonal, not projecting. Length, 6; height, 5; diameter, 3.6 mm.

TYPE is in U. S. N. M. No. 107649. Type locality, Station 3034, 24 fathoms mud; off Point Fermin, Lower California.

RANGE. Queen Charlotte Sound to Guaymas, Mexico.

Nucula cardara Dall, 1916.

Proc. U. S. N. M., **52**:394.

Shell polished, light olive green, thin, elongate-oval, with eight anterior and eighteen posterior prominent teeth, the resilifer prominent and largely free from the hinge line, the interior very pearly, the valve-margin smooth, the beaks hardly prominent, situated 5 mm. behind the anterior end of the shell and showing the whitish prodissoconch. Length, 16; height, 11.5; diameter, 8 mm. (Dall.)

TYPE in the U. S. N. M., No. 265905. Type locality, station 5673, off San Diego, California, in 1090 fathoms, mud.

RANGE. Monterey, California, to Lower California.

Nucula carlottensis Dall, 1897.

Plate 28, figs. 7, 8.

Nat. History Soc. British Columbia Bull. No. 2:6; pl. 1, figs. 15, 16.

Shell small, solid, yellowish olive color, moderately convex with inconspicuous beaks; in perfect specimens the prodissoconch is rather large, smooth and white, but it is commonly eroded; the nepionic shell outside the limits of the prodissoconch is distinguished from the rest by having only delicate concentric sculpture, which abruptly changes to a stronger sculpture of somewhat irregularly concentric ridges with narrower interspaces crossed by numerous fine uniform striæ; there is no well defined lunule or escutcheon; the margin in front of the beaks is marked by a radial impressed space, the margin enclosed by which is a little pouting; the interior of the shell is pearly, radially striate near the finely crenulate margin; the chondrophore is narrow and projects backward obliquely into the cavity of the valves; there are about eight anterior and twelve posterior teeth. Height of the shell, 5.2; length, 6; diameter, 3.5 mm.

TYPE in U. S. N. M. Type locality, off Queen Charlotte Islands, in 876 fathoms.

RANGE. Queen Charlotte Islands, British Columbia, to Anacapa Island, California.

Nucula exigua Sowerby, 1832.

Proc. Zool. Soc., p. 198. Hanley, *Mon. Nuculidæ;* pl. 4, fig. 136.

Nuc. testa parva, oblique ovata, albicante, pellucida, concentrice sulcata; latere postico longiore, subacuminato, antico brevissimo: long. 0.2, lat. 0.1, alt. 0.15 poll. (Sowerby.)

Shell minute, short, elevated, subtrigonal, very minutely decussated; posterior side acuminated below; anterior side truncated. (Conch. Iconica.)

TYPE in Mus. Cuming, British Museum. Type locality, West Colombia, Bay of Caracas.

RANGE. Golden Gate, California, to Acapulco, Mexico. In the Pliocene of San Pedro and San Diego, California.

Nucula tenuis Montagu, 1808.

Plate 5, fig. 12, and plate 37, fig. 4.

Test. Brit. Suppl., p. 56. Hanley, *Mon. Nuculidæ*, pl. 4, figs. 140, 141.

Shell sub-cordate, smooth, white, covered with an olivaceous epidermis; umbo very small; beaks slightly inflected, and placed near the end. Inside smooth, white and somewhat nacred; margin thin and entire; hinge pectinated with about fifteen elevated teeth placed within the margin, six on one side and nine on the other, divided by a small concave plate that projects inward. Length 4–8; height, 4; diameter, 2 mm. (Montagu.)

TYPE in Museum Cuming, London. Type locality, Dunbar, Britain.

RANGE. Point Barrow, Alaska, to Coronado Islands, California. Circumboreal. In the Pliocene at San Pedro, and San Diego, California.

Nucula tenuis expansa Reeve, 1855.

Plate 13, figs. 6, 7.

Last of the Arctic Voy., App., p. 397; tablet 33, fig. 2.

Shell large, ovate-triangular, tumid, the surface distinctly nucleated with ridges, both dorsal areas with fine radiating striæ; ten teeth in front and fifteen behind the beaks. Dark chestnut colored. (Reeve.)

TYPE in Mus. Belcher Cabinet. Type locality, Northumberland Sound, Arctic Ocean.

RANGE. Arctic Ocean to Sitka, Alaska, and San Diego, California.

Nucula darella Dall, 1916.

Proc. U. S. N. M., **52**:394.

Shell small, inflated, subtriangular, the anterior end slightly shorter; periostracum dark olive, the surface smooth except for somewhat irregular, inconspicuous incremental lines, but under a lens showing faint close radial striæ; lunule large, distinctly limited by an impressed line, mesially with a slight pout; about five anterior and eight posterior hinge teeth, the resilifer deep, small, central, not projecting; inner margins of the valves sharply radially grooved; beaks pointed, showing the prodissoconch plainly. Length, 4; height, 3; diameter, 2.7 mm. (Dall.)

TYPE in U. S. N. M., No. 111424. Type locality, Station 2923, off San Diego, California, in 822 fathoms.

RANGE. Known only from the type locality.

Subgenus ACILA H. & A. Adams, 1853.

Nucula castrensis Hinds, 1843.

Plate 5, fig. 11, and plate 37, figs. 1, 2.

Proc. Zool. Soc., 1843, p. 98, *Conch. Iconica*, **18**; pl. 4, species 32.

Nuc. testa elliptica, antice rotundata, epidermide olivaceous induta; lineis divaricatis; marginibus ventralibus crenulatis; cardine antice dentibus 5, postice 11. Long. 3; lat., 1½; alt., .2 lin. (Hinds.)

Shell small, elevated, subtrigonal, sculptured with raised lines diverging from the centre, pale straw banded with reddish brown; posterior side sloped, anterior side rather convex.

TYPE in Cabinet Belcher. Type locality, Sitka, Alaska.

RANGE. Bering Sea to San Diego, California. In the Pleistocene at Santa Barbara, San Pedro and San Diego; the Pliocene at San Fernando, San Pedro, San Diego; and the Miocene in Oregon and Washington.

Family LEDIDÆ

Genus **LEDA** Schumacher, 1817.

Shell oblong, rounded in front, produced and pointed behind; margin even; pallial line with a small sinus; umbonal area with a linear impression joining the anterior adductor. (Tryon. S. S. Conch.)

TYPE. *Arca rostrata* Linne.

DISTRIBUTION. Northern and Arctic seas, Siberia, New England, Britain, Mediterranean, Japan, Australia.

RANGE IN TIME. Silurian, United States, Europe, South India.

Leda minuta Fabricius, 1776.

Plate 5, fig. 5. Plate 19, figs. 2, 2a.

Fauna Gronl. p. 414. Hanley, *Mon. Nuculidæ,* pl. 3, figs. 61, 62.

Testa myis non dissimilis, oblonga, convexo-compressa, lævis transversim striata; albo flavicans, interne alba-glaba, extremitæ altera rotundata breviore, altera producta in rostrum attenuatum oblique truncatum, sique angulos 2 formans; deque inferiore atque superiore itidem innates currit carina arcuata minus emineus. Nates albæ non striatæ, acutæ, conniventes, versus extremitatem productiorum (quam anticam dico), parum flexæ; ante has dorsum testæ figuram planam, lanceolatam fine striis, fibi impressam habet. Cardinis dentes mimeriosi tam ante quam pone natesvitriusque valvulæ 10 numeravi conico-acutos alternatim insertos. Margo exterior, cardini oppositus, oblonge rotundatus intergervalvulæ arcte clausæ. Diam. 4 lin.; long. 2½ lin. (Fabricius.)

Shell oblong, pyriform, tumid, beaks at anterior third, slightly elevated, obtuse, inclined inward, anterior dorsal margin sloping so as to bring the somewhat acutely rounded point about midway to the base; posterior dorsal margin with about the same slope as the front, direct and slightly upturned very near the top, which is very small and squarely truncate; ventral margin full and well rounded, with a very slight emargination, under the tip; dorsal face very broad, with a wide, flattened, or somewhat depressed space, destitute of riblets, in front of the beaks, and a long lanceolate one defined by a sharp ridge behind. Length, 11; height, 6; diameter, 3 mm. (Gould Invert. Mass.)

TYPE locality, Greenland.

RANGE. Arctic Ocean to San Diego, California. Also Atlantic.

Leda minuta lomænsis Dall, 1919.

Proc. Biol. Soc. Wash., **32**:249.

This form is closely related to *L. minuta* Fabricius, but differs from that species by the following characters: the shell is thinner and more

compressed; the escutcheon is narrower and longer and less emphatically impressed; the sculpture rises in sharp thin low lamellæ, especially on the posterior area, which contrast with the thicker, blunt and more irregularly distributed ridges of *L. minuta*. There are about eight large and seven crowded small anterior teeth, a narrow oblique resilifer and about twenty, nearly all well developed posterior teeth. Length, 13.5; height, 6; diameter, 4 mm.

TYPE in U. S. N. M., No. 208872. Type locality, U. S. Fish Commission Station 4339, off Point Loma, California.

RANGE. Known only from the type locality.

Leda taphria Dall, 1897.

Plate 37, figs. 7, 7a, 8.

Nat. Hist. Soc. British Columbia, Bull. **2**:7; pl. 2, figs. 6–8.

Shell small, trigonal, oblong and rounded in front, produced and pointed behind; surface sculptured by numerous sharp, concentric, raised lines; umbone central, turned toward posterior end; escutcheon long, narrow and concentrically striated; hinge with prominent internal cartilage-pit, and about twelve sharp teeth on each side; pallial line with a small sinus; umbonal area with a linear impression joining the anterior adductor. Length, 9; height, 11; diameter, 8 mm. (Dall.)

TYPE is in U. S. N. M. Type locality off California coast.

RANGE. Bodega Bay, California to Lower California. In the Miocene, Pliocene, and Pleistocene of California.

Leda acuta Conrad, 1831.

Amer. Marine Conch., p. 182; pl. 38, fig. 496.

Ovate-lanceolate, ventricose, with prominent concentric striæ; anterior side longest, rostrated, compressed, acute at the extremity, which is slightly recurved; anterior submargin carinated; posterior end acutely rounded; basal margin profoundly curved, slightly sinuous near the anterior extremity, obliquely subtruncated toward the posterior extremity. Length, 6; height, 4 mm.

TYPE in State Museum at Albany or Philadelphia Academy. Type locality, Atlantic, North Carolina.

RANGE. Nazan Bay, Atka Island, Alaska, and Aleutian Islands, to Gulf of California. Also Atlantic.

Leda cellulita Dall, 1896.

Plate 5, fig. 7.

Nautilus, **10**, No. 1. *Bull. Nat. Hist. Soc. British Columbia*, No. **2**; pl. 2, figs. 5, 7.

Shell solid, with a dull olive-gray epidermis, moderately convex, with subcentral, not prominent beaks, base profoundly arcuate, anterior dorsal

slope rounded, posterior extreme bluntly pointed; escutcheon large, transversely striate; lunule not differentiated but similarly striate, sculpture of fine sharp, concentric grooves with wider interspaces, less arcuate than the incremental lines; chondrophore small, triangular, not projecting, with 22 anterior and 16 posterior hinge teeth on the cardinal border. Length, 15.5; height, 10.5; diameter, 7.2 mm.

TYPE in U. S. N. M. Type locality, Puget Sound, near Port Orchard.

RANGE. Puget Sound, Washington.

Leda navisa Dall, 1916.

Proc. U. S. N. M., **52**:395.

Shell elongated, arcuate, inequilateral, with slender recurved rostrum and well marked smooth impressed escutcheon but no lunule; base convexly arcuate, rostrum obliquely truncate, anterior end evenly rounded; beaks obscure, 5.5 mm. from the anterior end; sculpture of numerous sharp concentric low ridges, with wider flat interspaces, obsolete toward the rostrum; anterior teeth about 12, posterior about 20, the resilifer minute subumbonal, not projecting; interior chalky, a small medial ridge near the end of the rostrum. Length, 16; height, 7; diameter, 5 mm.

TYPE in U. S. N. M., No. 208770. Type locality off Farallon Islands, California, in 191 fathoms mud.

RANGE. Farallon Islands to San Diego, California.

Leda amiata Dall, 1916.

Proc. U. S. N. M., **52**:395.

Shell light olivaceous, elongated, compressed, the posterior dorsal margin nearly straight; beaks low, polished, about 3.5 mm. from the anterior end, showing the whitish prodissoconch; the smooth surface continues for a short distance when the sculpture changes to sharply evenly lamellose with slightly larger interspaces wider on the rostral area which is defined by the angular turn of the lamellæ which stop short at the sharp margin of the long escutcheon; interior porcellanous, with 12 anterior and 16 posterior teeth, the resilifer minute, subumbonal, hardly projecting. Length, 11.3; height, 4.5; diameter, 3 mm. (Dall.)

TYPE in U. S. N. M., No. 209252. Type locality, Station 4351, off San Diego, California, in 488 fathoms mud.

RANGE. Known only from the type locality.

Leda penderi Dall, 1910.

Plate 39, figs. 4, 5.

Canada Geol. Surv. Mem. 14N., No. 1143, p. 9, pl. 1, figs. 3, 4.

Shell small, solid, equivalve, nearly equilateral; the posterior side slightly longer, lighter or darker olivaceous in color, tumid, with the

anterior end rounded; the posterior angularly rostrate, the extreme end slightly recurved; anterior and posterior slopes nearly equal, the former a little convex, the latter slightly concave, the base convexly arcuate; lunule not defined, represented by a lanceolate narrow space, longitudinally striated; escutcheon similarly impressed, broadly lanceolate, bounded in each valve externally by a stout keel, the opposite margins hardly pouting in the median line; beaks low, and adjacent; sculpture of the disk composed of numerous concentric ridges, less arcuate than the incremental lines and separated by wider interspaces; more adjacent near the anterior end of the shells. An obscure radial ridge extends from the beaks toward the anterior end of the base. Interior polished, bluish, with entire margin. Ligament small, wholly internal. Hinge-teeth small, V-shaped, numbering 16 anterior (of which 6 are small and crowded), and 14 posterior (of which 6 are very small), separated by the ligamentary pit, which is small and not projecting. Length, 9.2; of beaks behind the anterior margin, 4.2; maximum height, 6; maximum diameter, 5 mm. (Dall.)

TYPE in U. S. N. M. Type locality Barkley Sound, Vancouver Island, British Columbia.

RANGE. Queen Charlotte Islands, British Columbia, to Santa Barbara, California.

Leda oxia Dall, 1916.

Proc. U. S. N. M., **52**:395.

Shell minute, rounded in front, very acute behind, the valve ending in a sharp point; base arcuate, beaks low, subcentral, dorsal slopes nearly straight; sculpture of regular, equal concentric ridges with subequal interspaces, a depressed ray from the beak to the base anteriorly, a deeply impressed, concentrically striated escutcheon bordered by a rounded keel; lunule linear; about eight teeth on either side of a minute resilifer. Length, 45; height, 3; diameter, 1 mm. (Dall.)

TYPE in U. S. N. M., No. 214848. Type locality, Station 2901, off Santa Rosa Island, California, in 48 fathoms, muddy bottom.

RANGE. Santa Rosa Island to the Gulf of California.

Leda liogona Dall, 1916.

Proc. U. S. N. M., **52**:396.

Shell small, light yellowish, concentrically sculptured with prominent elevated ridges with wider interspaces, except on the beaks where the prodissoconch is relatively large and perfectly smooth, the concentric sculpture commencing abruptly; beaks low, and about 3 mm. from the anterior end; base slightly arcuate, dorsal slopes direct, rostrum abruptly truncate; posterior dorsal area with two obscurely elevated rays over which the concentric sculpture is higher, but it becomes reduced to

striations upon the strongly impressed escutcheon; teeth much crowded, about 12 posterior, and about the same number in front of the minute subumbonal resilifer. Length, 9; height, 5.3; diameter, 3.3 mm. (Dall.)

TYPE in U. S. N. M., No. 214098. Type locality, Station 3604, Bering Sea, in 1401 fathoms mud.

RANGE. Known only from the type locality.

Leda pernula Müller, 1779.

Plate 19, figs. 7, 7a.

Beschaft. Ges. Naturf. Freunde zu Berlin, 4:55, Hanley, *Mon. Nuculidæ* pl. 3, figs. 56, 58.

Shell oblong, rostrate, thick, olivaceous, sculptured with numerous raised concentric striæ, more dense in the middle and slightly interrupted anteriorly; posterior side rostrated with a slight curve, depressed area circumscribed, inflated in the middle, apex obtuse; posterior side rather short, with an obscure ray, subacuminately rounded. Length, 17; height, 10; diameter, 5.5 mm. of a specimen from Etah, Greenland. (Conch. Iconica.)

TYPE in Berlin or Museum Sowerby. Type locality, North Sea.

RANGE. Arctic Ocean to Plover Bay. Also Atlantic.

Leda fossa Baird, 1863.

Plate 5, fig. 6.

Proc. Zool. Soc., p. 71, 1863. *Nat. Hist. Soc. Brit. Col. Bull.* No. 2; pl. 2, figs. 3, 13.

Shell small, elongate, convex, thin, umbones anterior, turning slightly toward the posterior end, which is elongated, narrow and truncated; anterior end short and evenly rounded, sculpture nearly obsolete, a few concentric lines discernible; escutcheon long, smooth and deep-set; an elongate process on the middle of interior of posterior end; hinge with a small internal cartilage-pit, and numerous teeth on each side. Length, 11; height, 6; diameter, 3.8 mm. (Baird).

TYPE. Location unknown to the writer. Type locality, Vancouver Island, British Columbia.

RANGE. Kotzebue Sound, Alaska, to Puget Sound. In the Pleistocene of California.

Leda fossa sculpta Dall, 1916.

Proc. U. S. N. M., 52:396.

This form has regular concentric ripples on the beaks, behind a faint depressed ray near the anterior end and on the keels on either side of the escutcheon. (Dall.)

TYPE in U. S. N. M., No. 107688. Type locality, Station 2855, southeast of Alaska Peninsula, in 60 fathoms mud.

RANGE. South of Alaska Peninsula.

Leda fossa vaginata Dall, 1916.

Proc. U. S. N. M., **52**:396.

This differs from the last in having the concentric sculpture finer and less evident, and spread over the entire shell. (Dall.)

TYPE in U. S. N. M., No. *226072*. Type locality, Station 4244, at Kana-an Bay, Alaska, in 50 fathoms mud.

RANGE. Known only from the type locality.

Leda fossa curtulosa Dall, 1916.

Proc. U. S. N. M., **52**:396.

Shell resembling variety *sculpta,* but relatively shorter than that of the typical form. (Dall.)

TYPE in U. S. N. M., No. 33771. Type locality, Unalaska Harbor, in 60 fathoms on ridge.

RANGE. Bering Sea and Unalaska.

Leda pontonia Dall, 1889.

Plate 1, figs. 4, 5.

Proc. U. S. N. M., **12**:257; pl. 13, fig. 5b.

Shell stout, strong, inflated, with a thin ochre-yellow or pale olive epidermis and recurved, pointed, posterior end; beaks approximate, full, incurved, not high, slightly anterior; anterior end evenly rounded, produced; posterior end vertically compressed, produced, recurved, pointed but not rostrate; base evenly arcuate; radiating sculpture of occasional faint miscroscopic striations near the ends of the shell, usually absent, and a marked but not sharp-edged ridge in each valve, extending from the beak to the posterior point and bounding the posterior dorsal area in each valve; concentric sculpture of numerous fine regular continuous rounded threads, separated by narrower grooves; this sculpture, however, becomes suddenly obsolete on the cheeks of the valves and in front of the ridges, but fades out in a central cordate area which, though not impressed, may be taken to represent the escutcheon; there is no obvious lunule; interior polished, muscular and pallial scars faint, the former small; pallial sinus shallow, small, and terminal; teeth V-shaped, anterior 16, posterior 13, all developed; fossette internal, deep-set, subtriangular, short. Length, 14.5; height, 10; diameter, 6.8 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Stations 2807 and 2808, in 812 and 634 fathoms, near the Galapagos Islands.

RANGE. Santa Barbara Islands, California, to Peru and the Galápagos Islands.

Leda leonina Dall, 1896.

Plate 13, fig. 18.

The Nautilus, **10**:2. *Nat. Hist. Soc. Brit. Columbia, Bull.* No. **2**; pl. 2, fig. 12.

Shell rather thin, compressed, with the low beaks at the anterior third; base slightly arcuate, anterior end rounded, posterior dorsal slope concave, lunule and escutcheon narrow, elongated, strongly impressed, smooth, with the valve margins elevated; rostrum broadly and a little obliquely truncate; sculpture of thin sharp concentric lamellæ strongest on the rostrum, epidermis dull olive-gray, dehiscent; hinge with 22 anterior and 28 posterior teeth, the chondrophore small, inconspicuous. Length, 25.5; height, 11; diameter, 5.25 mm. (Dall.)

TYPE in U. S. N. M. Type locality off Sea Lion Rock, coast of Washington, in 477–559 fathoms.

RANGE. Strait of Juan de Fuca to Latitude 36 north.

Leda amblia Dall, 1905.

Plate 3, fig. 8.

The Nautilus, **18**:123.

Shell chalky under a polished dark olive-green periostracum, compressed, rostrate, concentrically and feebly irregularly striate, with obscure microscopic radial lines; lunule narrow, lanceolate; escutcheon, long, wide, smooth and slightly concave, the valve margins rising slightly in the median line; valves bluntly rounded in front, bluntly truncate behind, the rostrate portion not set off from the body by any constriction, and the radial subangular lines which bound the rostral area are feeble and obscure; interior whitish, with a deep subumbonal impression, a very shallow and obscure pallial sinus, very short siphons, 12 or 13 anterior, 18 or 19 posterior normal hinge teeth, with a narrow backwardly oblique socket for the resilium. Length, 18; height, 9.5; diameter, 5.5 mm.

TYPE in U. S. N. M. Type locality, Monterey Bay, California.

RANGE. Monterey Bay, California.

Leda conceptionis Dall, 1896.

Plate 39, fig. 1.

The Nautilus, **10**, No. **1**; 2. *Nat. Hist. Soc. Brit. Columbia Bull.* No. **2**; pl. 2, fig. 1.

Shell elongate, smooth, polished, compressed, with the beaks in the anterior third; base arcuate, prominent below the beaks; anterior dorsal slope slightly rounded, posterior slope straight, rostrum narrow, pointed, obliquely truncate, cardinal margin elevated between the halves of the narrow impressed, almost linear lunule and escutcheon; beaks very small, low, the prodissoconch conspicuous; hinge with 18 anterior and 33 posterior small and delicate teeth; the chondrophore narrow, produced pos-

teriorly, interior of the rostrum without a longitudinal septem. Length, 27.5; height, 10.5; diameter, 4.5 mm.

TYPE in U. S. N. M. Type locality, off Point Conception, California.

RANGE. Aleutian Islands to San Diego, California.

Leda gomphoidea Dall, 1916.

Proc. U. S. N. M., **52**:396.

Shell elongate, inequilateral, smooth, polished, the rostrum obliquely rounded-truncate, the anterior side rounded and shorter; beaks small, but pustule like, 5 mm. from the anterior end, the prodissoconch distinct; teeth small and numerous, about 25 in front of and 35 behind the small oblique resilifer; posterior basal and dorsal margins nearly straight, the escutcheon narrow, long impressed, and straight. Length, 17.5; height, 8; diameter, 4 mm. (Dall.)

TYPE in U. S. N. M., No. 212889. Type locality, Station 3346 off Tillamook Bay, Oregon, in 786 fathoms.

RANGE. Known only from the type locality.

Leda extenuata Dall, 1897.

Plate 28, fig. 3.

Nat. Hist. Soc. Brit. Col. Bull. No. **2**:8; pl. 2, fig. 2.

Shell elongated, arcuate, slender, compressed, of pale olive color, with a smooth but not brilliant periostracum; surface sculptured with delicate concentric hardly elevated ridges; beaks acute, small, a flat ridge, medially depressed, extends from them to the end of the elongated, obliquely truncate, rostrum; there is no lunule, but between the rostral ridges a depressed smooth space might be regarded as an escutcheon; valves very inequilateral, the beaks $\frac{3}{34}$ of the distance from the anterior to the posterior end; interior white, smooth with an elevated ridge unequally dividing the rostral channel; chondrophore small directed backward; hinge plate very narrow, bearing extremely oblique, long, narrow, laminar teeth, of which 9 are anterior and 12 posterior. Length, 17; height, 6; diameter, 3 mm. (Dall.)

TYPE in U. S. N. M. Type locality off Dixon Entrance, British Columbia, in 1569 fathoms ooze.

RANGE. Alaska to British Columbia.

Leda spargana Dall, 1916.

Proc. U. S. N. M., **52**:397.

Shell small, elongate, inequilateral, pale olivaceous, compressed; prodissoconch conspicuous, otherwise the beaks are low, and about 4 mm. from the anterior end of the shell; sculpture of low concentric ridges, stronger anteriorly, sparser toward the beaks, and obsolete on the dorsal

area behind; there is an obscure radial depression anteriorly, and two obscure radial ridges on each side of the impressed escutcheon where the dorsal margin of the valves is prominently elevated; there are about 12 anterior and 18 posterior teeth, the resilifer is small, rotund, and subumbonal; there is a small mesial ridge near the end of the rostrum internally. Length, 12; height, 5; diameter, 2.6 mm. (Dall.)

TYPE in U. S. N. M., No. 208897. Type locality, Station 4367, off Point Loma, San Diego, California, in 215 fathoms mud.

RANGE. Santa Barbara to Point Loma, California.

Leda fiascona Dall, 1916.

Proc. U. S. N. M., **52**:397.

Shell small, rounded, thin, dull olive, the anterior slightly shorter than the posterior end, the base arcuate; the posterior end attenuated, compressed, pointed; sculpture of fine concentric threads, close set and covering the anterior two-thirds of the valves, stopping abruptly at the posterior third where the compression begins; beaks not prominent, a small and narrow lunule and escutcheon indicated; hinge with eight anterior and about four posterior teeth, the resilifer small, subumbonal, not projecting. Length, 4; height, 2.7; diameter, 1.7 mm. (Dall.)

TYPE in U. S. N. M., No. 215597. Type locality, Station 2923, off San Diego, California, in 322 fathoms mud.

RANGE. Known only from the type locality.

Leda phenaxia Dall, 1916.

Proc. U. S. N. M., **52**:397.

Shell small, solid, plump, smooth, except for faintly evident incremental lines and delicate radial striulæ; periostracum dark olive immediately under the beaks blackish for a short distance; base evenly arcuate, dorsal slopes nearly straight; beaks nearer the anterior end, full not pointed, with a short-cordate lunular impression and narrow, elongate escutcheon, neither defined by any sharp boundary; hinge very strong for the size of the shell, with about 8 or 9 long teeth on each side of a rather strong resilifer. Length, 4.5; height, 3.5; diameter, 1.3 mm. (Dall.)

TYPE in U. S. N. M., No. 215596. Type locality, Station 2923, off San Diego, in 322 fathoms mud.

RANGE. Known only from the type locality.

Leda hamata Carpenter, 1864.

Plate 6, fig. 4, and plate 37, fig. 5.

Suppl. Rep. Brit. Assoc., p. 98. *Proc. U. S. N. M.*, **24**; pl. 40, fig. 9.

Shell compressed, arched, lanceolate, concentrically ridged, covered with a thickish epidermis; posterior side attenuated, elongated, arched,

beaked, dorsal margin concave, rostral area truncated at the end; umbones elevated, acute; ventral margin very convex; anterior side very short. Length, 8; height, 5; diameter, 2.5 mm. (Conch. Iconica.)

TYPE in British Museum. Type locality, Santa Barbara, California.

RANGE. Puget Sound to Panama Bay. In the Pliocene and Pleistocene of California.

Leda hamata limata Dall, 1916.

Proc. U. S. N. M., **52**:397.

In this variety the valves have the same profile as in the typical form but the strong concentric sculpture, which is so uniform in the northern specimens of this species, is subject to extraordinary mutations, which taken alone would appear to represent perfectly distinct species. In the extreme form of this variety the surface of the disk is perfectly smooth. In another mutation there are a few very coarse concentric ridges near the umbones. In still another the umbonal region is smooth and the ridges appear near the basal margin.

TYPE in U. S. N. M., No. 211296. Type locality, Station 2902, off Santa Rosa Island, California, in 50 fathoms.

RANGE. Santa Barbara to San Diego, California.

Leda dalli Krause, 1885.

Plate 13, figs. 1, 2, 3.

Arch. f. Naturg., **51**:27; pl. 3, figs. 1 a–c.

Testa oblonga, modice convexa, umbonibus sat prominulis paullo ante medium sitis; parte anteriore late rotundata et valde compressa, superne vix angulata, parte posteriore angustata; superficie nitidissima, albovirescente, long. usque ad 4.5 mm. (Krause.)

Diese kleine Portlandia, welche ich nach dem verdienten Erforscher Alaskas zu benennen mir erlaubt habe, wird hauptsächlich dadurch charakterisirt, dass der kurzere vordere Theil sehrkeilformig zusammengepresst ist; der Schlossrand bildet mit dem vorderen einen mehr oder weniger deutlichen Winkel; das etwas verschmälerte Ende ist nur am Rande ein wenig abgeflacht; ein wesentliches Merkmal bildet ferner die ziemlich grosse Ligamentgrube, welche sich schräge von den Wirbeln nach hinten zu erstreckt. Der hintere Schlossrand hat 8, der vordere 4–5 Zähne. Die Epidermis ist dünn, glännzend, von weisslich grüner Farbung. Nach gütiger brieflicher Mittheilung von Herrn Gw. Jeff. ist die vorliegende Art nicht die Yoldia intermedia Cpr., welche Dall in seinem Cat. der Beringsmeer-Moll. anfurt. (Krause.)

TYPE in Stuttgart Royal Cabinet. Type locality, Bering Sea.

RANGE. Unalaska, Aleutian Islands.

Leda radiata Krause, 1885.

Arch. f. Naturg., 51:23; pl. 3, figs. 2 a–c.

L. pernulæ forma silillima, sculptira lineis radiantibus elevatis insignis. (Krause.)

In der Gestalt stimmt die vorliegende Leda mit den kürzeren bauchigen Formen der Leda pernula, die den Übergang zu L. buccata Steenstr. machen, sehr gut überein; ihre Massverhältnisse sind: long., 25.5 alt., 13 crass .9 mm. Die für L. pernula Mull. characteristische Rippe auf der Innenseite vom Wirbel bis zur unteren Ecke des Schnabels (vergl. Leche: Vegaexpedition pag. –448) ist bei ihr ebenfalls deutlich ausgebracht.—Sehr eigenthümlich ist die Sculptur der Schalen, welche auf ihrer ganzen Fläche von feinen, dicht stehenden radialen Rippen durchzogen werden, die ihrerseits von entfernter stehenden Anwachslinien gitterartig gekreuzt werden. Eine andere, stärker in die Augen fallende Radialsculptur des Mittelfeldes entsteht dadurch, dass die Anwachsstreifen durch flache Radialfurchen unterbrochen und gewinkelt werden, in der Weise, wie es Fig. 2b. veranschaulicht.—Zwar zeigen auch norwegische und grönlandische Exemplare der L. pernula eine mehr oder weniger deutliche Radialsculptur, doch ist dieselbe ganz anderer Art, da sie nur aus linienartigen Vertiefungen zwischen Anwachsstreifen besteht, ohne die erhabenen feinen Linien, welche unsere Varietät auszeichnen. Bei den vorliegenden norwegischen Exemplaren der L. pernula findet sich eine vom Wirbel aus schräg nach vorn zu verlaufende flache Einsenkung; diese fehlt bei unserem Exemplare, dessen Schalen vorn ganz regelmässig gewölbt sind, gerade so, wie bei L. minuta Mull. (Krause.)

Type in Stuttgart Royal Cabinet. Type locality, Emmahafen, Plover Bay, Bering Strait.

Range. Arctic Ocean, Plover Bay, Eastern Siberia, Okhotsk and Bering Seas.

Leda buccata Steenstrup, 1842.

Moller, *Index Moll. Grönl.*, p. 17. Hanley, *Mon. Nuculidæ;* pl. 3, figs. 63, 64.

Testa transversim oblongo-ovata, ventricosiuscula, fusco-olivacea concentrice minuterugosa; margine inferiori leviter arcuata. Diameter, 9 mm. (Steenstrup.)

Shell thick, broad, oblong, somewhat arched, nearly concentrically sulcated, inequilateral; posterior side rather attenuated, beaked, with two very obscure smooth ribs, obliquely truncated at the end; anterior side rather short, inflated, rather rounded. (Conch. Iconica.)

Strongly resembling *L. pernula,* but a stouter, more inflated and deeper shell.

Type in British Museum. Type locality, Greenland.

Range. Arctic Ocean and Bering Sea. Also Atlantic.

SECTION PORTLANDIA Mörch, 1853.

Leda collinsoni Dall, 1919.

Plate 40, figs. 4, 5.

Report Canadian Arctic Exp., **8**, part A; pl. 11, figs. 3, 4.

Shell small, inflated, slightly inequilateral, olivaceous in the young, tending to a dark brownish tint in the adult, the periostracum strong, minutely evenly vermiculately wrinkled all over; anterior end shorter, evenly rounded; posterior portion with a rounded ridge extending to the posterior extremity where it forms a rounded point, the shell being compressed above this ridge and the margin below slightly incurved and retractively obliquely truncate; the basal margin is slightly rounded; there is a small lanceolate impressed area in front of the low, slightly opisthocœlous beaks, and a large one behind them, but there is no circumbscribed lunule or escutcheon; the interior is white, there is a large triangular resilifer below the beaks and eleven anterior and eight posterior hinge teeth; no indications of a pallial sinus appear on the specimens but the adductor scars are large and conspicuous. Height of specimen, 6; length, 8.5; diameter, 4 mm. (Dall.)

TYPE in Museum at Ottawa, Nos. 4150 and 4151, type and co-type. Type locality, Station 27s., off Collinson Point, Alaskan Arctic, in 3 fathoms.

RANGE. Known only from the type locality.

Leda arctica Gray, 1819.

Plate 19, figs. 6, 6a.

App. Parry's Voy., p. ccxli. Hanley, *Mon. Nuculidæ;* pl. 1, fig. 5.

Shell oval-elliptical, smooth, very slightly concentrically wrinkled; epidermis yellowish-green, glossy; umbones rather acute, nearly central; broad rounded, rather narrowed, obliquely truncated behind; inside glossy-white, edge plain in front. Length (from front to back), one-half inch; depth (from umbones to the opposite edge), one-fourth; breadth, one-sixth inch. (Gray.)

TYPE in British Museum. Type locality, Arctic.

RANGE. Collinson, Arctic Ocean and also Atlantic.

Leda glacialis Gray, 1828.

Reeve, *Conch. Iconica*, **18**. *Index Test. Suppl.*, pl. 2, fig. 6.

Shell oblong-subquadrate, thin, ventricose, covered with an olive or blackish brown epidermis; posterior side widely angular, sculptured above, ventral margin obliquely truncated at the end, dorsal margin slightly concave, depressed; umbones rounded, elevated, ventral margin rather

straight in the middle; anterior side short, rather rounded. Length about 13 mm. (Conch. Iconica.)

Described as *Yoldia glacialis* Gray.

TYPE in British Museum. Type locality, Arctic.

RANGE. Arctic Ocean, Point Barrow. Also Atlantic.

Genus **YOLDIA** Möller, 1842.

Shell oblong, slightly attenuated behind; compressed, gaping, smooth or obliquely sculptured, with a dark olive shining epidermis; external ligament slight; cartilage as in Leda; pallial sinus deep. (Tryon. S. S. Conch.)

TYPE. *Yoldia myalis* Couthouy.

DISTRIBUTION. Arctic and Antarctic seas, Greenland, Massachusetts, Brazil, Norway and United States.

RANGE IN TIME. Silurian and Pleistocene.

Yoldia thraciæformis Storer, 1838.

Plate 5, fig. 1.

Boston Jour. Nat. Hist., **2**:122; text figure.

N. testa ovato-oblonga, transversa, nigra, crassa; antice rotundata, postice subtruncata et compressa, umbonibus prominentibus; cardine fovea magna. (Storer.)

Shell ovate, transverse, equivalve, inflated, gaping at both extremities, with numerous, very distinct, concentric lines of increment, covered with a yellowish-green, polished epidermis in young specimens, concealed under a black pigment, which readily rubs off in the recent specimen, giving a sooty appearance to the fingers. In the adult shell the epidermis is rather a dirty brown. Beaks slightly prominent over hinge margin. An obtuse angle, more elevated and wider at its lower half, runs obliquely from the umbones to the posterior base of the shell, serving as a boundary to the anterior inflated portion. Posterior portion of the shell much compressed, its epidermis is of a lighter color, and the striæ of increase are much more apparent, than upon the anterior portion. Anterior margin rounded; posterior somewhat truncated. Within perlaceous. Teeth, numerous and peculiar; those contiguous to hinge, small, those farther removed from fosset, very strong, sharp, angulated, higher than wide; the teeth of one valve shutting very closely into the excavated teeth of the opposite valve, form a very powerful hinge. Length, 57; height, 35 mm. (Storer.) Described as Nulula thraciæformis.

TYPE in British Museum. Type locality, off Point Race, Atlantic.

RANGE. Arctic to Oregon and Puget Sound. Also Atlantic.

Yoldia secunda Dall, 1916.

Proc. U. S. N. M., **52**:398.

Shell large, thin, inequilateral, inflated, subtruncated and recurved behind; color of a light grayish olive, more or less disposed in zones; this shell much resembles *Y. thraciæformis* Storer, though it does not attain so great a size; it differs by the absence of the oblique elevated posterior ray from the umbones, in being more attenuated behind, and in general more cylindrically inflated; the hinges hardly gape in front, and less behind than in that species; the hinge teeth are more numerous and smaller than in *thraciæformis* of the same length. There are 24 anterior and 20 posterior teeth, the resilifer is similar to but smaller than in the species referred to above, which has 20 anterior and 10 posterior teeth in a valve of the same length. Length, 39; height, 22; diameter, 14 mm. (Dall.)

TYPE in U. S. N. M., No. 107688. Type locality, Station 3077, in Clarence Strait, Alaska, in 322 fathoms.

RANGE. Southeastern Alaska, in deep water.

Yoldia beringiana Dall, 1916.

Plate 5, fig. 4.

Proc. U. S. N. M., **52**:399.

Shell large, thin, smooth, except for lines of growth, brilliantly polished, inequilateral, hardly rostrate, rounded at each end, less compressed behind than *Y. secunda;* color a rich yellowish brown, slightly olivaceous near the umbones; valves closing completely; escutcheon striated, narrower than in secunda; beaks very low, 24 anterior and 17 posterior teeth, the resilifer ample, cup-shaped, projecting. The pallial sinus is rather large and rounded. Length, 40; height, 22; diameter, 16 mm. (Dall.)

TYPE in U. S. N. M., No. 226159. Type locality, Station 3607, Bering Sea, off Pribiloff Islands in 987 fathoms.

RANGE. Known only from the type locality.

Yoldia montereyensis Dall, 1893.

Plate 28, fig. 4.

The Nautilus, 7, No. 3:29. *Nat. Hist. Soc. Brit. Columbia, Bull.* No. 2; pl. 2, fig. 16.

Shell large, stout, inflated, with a polished, dark greenish olive epidermis; beaks eroded in all the specimens, situated in the anterior part of the middle third of the shell, not prominent; valves full and rounded, anterior end evenly rounded into the upper and basal margins; posterior end narrower, rounded, the extreme end nearer the cardinal margin with which it almost forms an angle, below sloping obliquely toward the basal margin, with a very obscure broad ray impressed in a radiating manner from the beaks toward the oblique slope, the profile of which it does not

perceptibly indent; surface sculptured only by feebly incremental lines; epidermis polished, with one or two darker concentric color zones and a microscopic, irregular, radially disposed wrinkling, most conspicuous at the margins of the impressed ray; posterior cardinal margin nearly straight, anterior ditto evenly rounded; interior porcellaneous white, the pallial sinus not reaching the middle vertical line of the shell, broad and rather rounded, ligamental fosset large, cup-like; anterior teeth V-shaped, about 22 in number, strong and prominent; posterior teeth similar, and forming an equally long line but only 18 in number, the posterior cardinal margin showing a long narrow impressed area very feebly marked. Length, 32; height, 17; diameter, 13 mm. (Dall.)

TYPE in U. S. N. M., No. 106972. Type locality, U. S. Fish Com. Station 3202, in 382 fathoms green mud, Monterey Bay, California.

RANGE. Chirkoff Island, Alaska, to San Diego, California.

Yoldia martyria Dall, 1897.

Plate 39, fig. 11.

Nat. Hist. Soc. Brit. Col., Bull. No. **2**:9; pl. 2, fig. 15.

Shell olive greenish, polished, smooth, nearly equilateral; surface sculptured only by obsolete incremental lines; two or three extend obliquely backward from the beaks, due to some variation of color in the periostracum, but these do not interrupt the smoothness of the surface; beaks full, but not prominent; base arcuate, posterior end roundly pointed, compressed, slightly recurved; there is a long narrow, slightly impressed lunule and escutcheon, both of which are delicately striate longitudinally, and the dorsal margins included within them are not quite closed; the rostrum gapes slightly, but there is no obvious pedal gape; within the shell is white, with a deep rounded pallial sinus; chondrophore rounded, one-half of it projecting below the hinge plate; there are 21 anterior and 17 posterior teeth, narrow, high, and rather strong. Length, 26; height, 5; diameter, 11 mm. (Dall.)

TYPE in U. S. N. M. Type locality, off San Pedro Martir Island, Gulf of California.

RANGE. Kana-an Bay, Alaska, to the Gulf of California.

Yoldia vancouverensis E. A. Smith, 1880.

Ann. Mag. Nat. Hist., (5), **6**:289.

Shell almost equilateral, transversely elongate-oval, acuminated posteriorly, slightly gaping at both ends, clothed with a greenish olivaceous epidermis, which is darker toward the ventral margin and varied at intervals with dark zones. Surface not very glossy, marked with concentric lines of growth and close microscopic striations and granulation. Anterior side a trifle the longer, regularly rounded at the margin, posterior

more acute. Hinder dorsal slope nearly rectilinear, scarcely arcuate, area distinct. Length, 12; width, 22½; diameter, 6 mm.

TYPE in British Museum. Type locality, Vancouver Island, British Columbia.

RANGE. Vancouver Island.

SECTION YOLDIA s. s.

Yoldia myalis Couthouy, 1838.

Plate 5, fig. 8.

Boston Jour. Nat. History, **2**:62; pl. 3, fig. 7.

Shell ovate, nearly equilateral, slightly gaping at both extremities, moderately convex, with numerous ridges of growth; summits antero-dorsal; posterior side rather more than half the whole length, posterior superior margin somewhat depressed, inferior rounded; anteriorly sub-rostrate, not truncated, slightly compressed laterally and superiorly, anterior dorsal area lanceolate, smooth, shiny, carinated and rectilinear in its whole extent from the beaks to the extremity, posterior dorsal area superficial, elliptical and finely striated; basal margin regularly curved and entire; ligamentary fossa median, triangular and profound; teeth from 20 to 22, posteriorly rectilinear, angulated anteriorly or internally and slightly inclined to the summits; color of the interior dull yellowish-white; muscular impression well defined, bi-partite, the anterior one rounded or oval, posterior subtriangular; epidermis thin, smooth, dark olive with paler zones interposed between the incremental lines. Long., $^{22}/_{20}$; lat., $^{7}/_{20}$; alt., $^{12}/_{20}$ of an inch. (Couthouy.) (Naucula myalis.)

TYPE in Bost. Soc. Nat. History? Type locality, Massachusetts Bay.

RANGE. Arctic Ocean to Puget Sound.

Yoldia cooperi Gabb, 1865.

Plate 1, fig. 1, and plate 37, fig. 9.

Proc. Cal. Acad. Sci., **3**:189. *Pal. California,* **2**; pl. 9, fig. 54.

Shell thin, subcompressed, very inequilateral; beaks minutely placed in advance of the middle, becoming more anterior as the shell increases in size; anterior end narrow subacuminate; posterior end broadly rounded; base most prominent behind the middle, curving upward to the anterior end, surface sculptured by numerous small concentric ribs, rarely dichotomous, abrupt on the upper side, and sloping downward on the side toward the base, muscular scars large, the posterior a third the largest, broadly suboval, anterior triangular. Length, 50; height, 25; diameter, 9 mm. (Gabb.)

TYPE in Cooper collection, University of California. Type locality, Monterey, California.

RANGE. San Francisco Bay to San Diego, California. In the Pliocene of San Fernando and the Pleistocene at San Pedro and San Diego.

Yoldia limatula Say, 1831.

Plate 19, figs. 1, 1a, 1b.

Amer. Conch., **163**: pl. 12, Hanley, *Mon. Nuculidæ*, pl. 1, fig. 9.

Shell transversely elongated subovate, green olive, nearly pellucid, smooth, polished, with slight indulations of increment; beaks not prominent above the curve of the hinge margin; hinge margin anteriorly abruptly compressed; the compression not reaching the tip; rectilinear nearly to the tip which is a little recurved; posteriorly almost regularly, but obtusely arcuated; posterior margin regularly rounded; anterior margin somewhat rostrated, not truncated; within a little perlaceous; margin entire; line of the teeth slightly interrupted and a little angulated at the fosset, extending more than two-thirds of the length of the shell, rectilinear before and behind; teeth prominent, numerous, acute, much angulated at their bases and longer than the breadth of their bases; fossette triangular, short, rather small, and but little oblique. (Say.)

TYPE in British Museum? Type locality, Nahant, Massachusetts, from stomach of a fish.

RANGE. Arctic Ocean to San Diego, California. Also Atlantic.

SECTION CNESTERIUM Dall, 1898.

Yoldia scissurata Dall, 1898.

Plate 5, fig. 2.

Trans. Wagner Inst. Sci., **3**; part **4**:595. *Cal. Acad. Sci. Mem.*, **3**:1903.

Shell rather small, oval, compressed, very thin, translucent, only slightly narrowed posteriorly; umbones minute, slightly anterior to middle, the anterior margin is evenly convex; a thin lamina runs along the anterior margin from the umbo to the end of the shell, a much narrower one also occurs on the posterior margin; surface sculptured concentrically as in *Y. cooperi*, except that this incised sculpture is not in harmony with the incremental lines; hinge and teeth similar to *Y. cooperi*. Length, 20.4; height, 10; diameter, 4 mm. (Arnold.)

TYPE in U. S. N. M. Type locality, St. Paul, Kodiak Island, Alaska.

RANGE. Arctic Ocean to Puget Sound. In the Pleistocene at San Pedro, California.

Yoldia seminuda Dall, 1871.

Amer. Journ. Conch., **7**:153.

Shell obscurely lozenge-shaped, elongate, covered with a polished, glossy, olivaceous epidermis. Valves compressed, umbones inconspicuous;

lunule long, narrow, just evident; escutcheon long, narrow, indented, well defined. Ventral margin arcuated, widest about the middle of the shell; a slight obsolete groove or channel anteriorly bordered by two obscure ridges, terminates in a slight waved indentation in the anterior ventral margin, about the middle of the anterior fourth. Posterior end rising obliquely, rounded truncate posteriorly, forming an angle of 90° with the hinge margin, and slightly upturned. Posterior dorsal slope slightly concave, anterior slightly convex, evenly rounded to the anterior end. Ligament pit large, roundly triangular. Teeth (anterior) 37, (posterior) 17. Pallial sinus reaching before the umbones, which are $^{14}/_{35}$ of the whole length from the posterior end. Interior bluish white, with fine radiating lines. Exterior marked by lines of growth and obsolete radiating lines; sculptured by sharp grooves, which, beginning near the middle of the shell with a slight wave toward the umbones, pass backward and downward across the lines of growth, rising a little and ceasing abruptly at a distance of about $^{4}/_{35}$ of the whole length from the posterior end. Long., 1.74; alt., .82; diameter, 7.2 in. (Dall.)

TYPE in U. S. N. M. Type locality, St. Pauls Harbor, Kodiak Island, in 17 fathoms.

RANGE. Okhotsk and Bering seas to Sitka, Alaska.

Yoldia ensifera Dall, 1897.

Plate 5, fig. 3, and plate 37, fig. 6.

Nat. Hist. Soc. Brit. Col. Bull. No. **2**:9; pl. 2, fig. 4.

Shell large, thin compressed, with a brilliant olivaceous periostracum, usually showing darker and lighter zones; valves nearly equilateral, moderately convex, rostrate, subarcuate; sculpture of fine lines of growth more or less evident, and on the anterior two-thirds of the shell numerous irregularly fluctuating, distant, incised grooves (like those of *Y. scissurata*) which are absent on the posterior third; base, arcuate, anterior dorsal profile rounded evenly from the beaks; a slight inward wave of the margin is visible anteriorly near the pedal gape; lunule absent; the escutcheon impressed, and the posterior dorsal margins of the valves, projecting vertically, blade-like and slightly pouting; rostrum pointed, slightly recurved, beaks low, inconspicuous; valves internally whitish; pallial sinus deep, rounded; chondrophore wide, hardly projecting; teeth narrow, ∧-shaped, slender, about 30 in front of and 24 behind the chondrophore. Length, 35; height, 16; diameter, 6 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Vancouver Island, British Columbia.

RANGE. Southeastern Alaska to San Diego, California.

Yoldia ensifera plena Dall, 1908.

Proc. U. S. N. M., **34**:256.

This species in its typical form is abundantly distinguished from the *Y. scissurata* Dall (which is the common Arctic species usually named *Y. lanceolata* in collections), especially by its form and the prominent blades upon the posterior dorsal margins, which are three times the size of the same parts in the Arctic species. The peculiar grooving of the valves in *ensifera* is comparatively feebler, toward the ends especially, compared with that of *scissurata,* which is not only stronger but covers the whole valve except a small portion near the posterior end, while in *ensifera* both ends are usually free from grooves; but Professor Kelsey has dredged in 80 fathoms, off the entrance to San Diego Harbor, a variety which, while agreeing in form and hinge characters with *ensifera,* has the grooving extending to within 6 mm. of the posterior extremity and over the whole anterior end in specimens 28 mm. long, while a large series from San Pedro to the Aleutian Islands does not afford a single instance of such extension. It seems, therefore, that the difference is marked enough to constitute a nameable variety, which may take the name of *plena.* Length, 30; height, 16; diameter, 6 mm. (Dall.)

TYPE in U. S. N. M. Type locality, 80 fathoms off entrance to San Diego Harbor.

RANGE. Known only from type locality.

SECTION YOLDIELLA, Verrill, 1897.

Yoldia oleacina Dall, 1916.

Proc. U. S. N. M., **52**:398.

Shell small, plump, smooth, except for faint incremental lines, brilliantly polished, of a bright yellow brown with a slight olivaceous tint toward the beaks; egg-ovate, rounded and broader in front, attenuated behind; beaks broadly arcuate, dorsal margin gently curved; beaks low, 6 mm. from the anterior end; no defined lunule or escutcheon; 13 anterior and 11 posterior hinge teeth, the resilifer subumbonal, cup-like; the pallial line has a slight shallow sinus near the posterior adductor scar. Length, 16; height, 9; diameter, 6 mm. (Dall.)

TYPE in U. S. N. M., No. 223407. Type locality, Arctic Ocean north of Bering Strait.

RANGE. Known only from the type locality.

Yoldia orcia Dall, 1916.

Proc. U. S. N. M., **52**:399.

Shell small, thin, pale olive, brilliantly polished, smooth, equilateral; base deeply arcuate; beaks not prominent, the posterior end slightly com-

6483

pressed, pointed and attenuated, the anterior end rounded; hinge with 8 anterior and 6 very minute posterior teeth, the resilifer subumbonal, extremely small. This species has no indication of lunule or escutcheon. Length, 4.5; height, 3.5; diameter, 2 mm. (Dall.)

TYPE in U. S. N. M., No. 111420. Type locality, Station 2923, off San Diego, California, in 322 fathoms mud.

RANGE. Tillamook Bay, Oregon, to San Diego, California.

Yoldia sanesia Dall, 1916.

Proc. U. S. N. M., **52**:399.

Shell small, thin, plump, pale olivaceous, inequilateral, the anterior end shorter, the beaks 2.6 mm. behind it; base roundly arcuate, dorsal slopes nearly straight, anterior end rounded, posterior end slightly recurved, compressed and bluntly rounded; beaks low, inconspicuous, with no indications of lunule or escutcheon; hinge with 7 or 8 very minute anterior and about 10 posterior teeth, the resilifer subumbonal and minute. Length, 6; height, 4; diameter, 2.5 mm. (Dall.)

TYPE in U. S. N. M., No. 223578. Type locality, Station 4224, in Boca de Quadra, Alaska, in 160 fathoms mud.

RANGE. Boca de Quadra, Alaska, to Point Conception, California.

Yoldia cecinella Dall, 1916.

Proc. U. S. N. M., **52**:399.

Shell minute, polished, smooth, nearly equilateral, the margins arcuate above and below, the anterior end rounded, the posterior more pointed and slightly longer; beaks low and inconspicuous, with neither lunule nor escutcheon indicated; hinge with 6 or 7 minute teeth on each side of the subumbonal, very small resilifer. Length, 5; height, 2.6; diameter, 1.5 mm. (Dall.)

TYPE in U. S. N. M., No. 211424. Type locality, Station 2823, off La Paz, Gulf of California, in about 26 fathoms.

RANGE. Aleutian Islands to the Gulf of California.

Yoldia capsa Dall, 1916.

Proc. U. S. N. M., **52**:400.

Shell very thin, small, polished, smooth, compressed, the beaks hardly rising above the general hinge line; base deeply arcuate, the dorsal margin very slightly convex; anterior end rounded, posterior end slightly broader and flatter, obscurely pointed toward the dorsal level; beaks slightly anterior to the middle line of the shell; hinge with a few very small anterior and posterior teeth; the resilifer subumbonal, not projecting. Length, 4.4; height, 3; diameter, 1.5 mm. (Dall.)

TYPE in U. S. N. M., No. 212499. Type locality, Station 3346, off Tillamook Bay, Oregon, in 786 fathoms.

RANGE. Known only from the type locality.

Yoldia siliqua Reeve, 1855.

Last of the Arctic Voy., **2**:396; pl. 33, fig. 8.

Shell oblong-subquadrate, thin, ventricose, covered with an olive or blackish brown epidermis; posterior side widely angular, acuminated above, ventral margin obliquely truncated at the end, dorsal margin slightly concave, depressed; umbones rounded, elevated, ventral margin rather straight in the middle; anterior side short, rather rounded. (Reeve.)

TYPE in British Museum. Type locality, Arctic Ocean.

RANGE. Arctic Ocean, Point Barrow. Also Atlantic.

Yoldia intermedia Sars, 1865.

Plate 1, figs. 7, 10.

Fos. Dyre. Quatern. period, p. 38; figs. 92, 96; or tablet 4, figs. 9, 9a.

Testa tumida, forma sub elliptica, duplo fere longior quam altior, extremitate antica breviore et rotundata, postice producta, leviter attenuata, apice obtuso, margine ventrali medio parum arcuato postice oblique ascendente, dorsali postice fere horizontali, umbonibus marginis et prominentibus non nihil ante medium sitis. Valvulæ tenues, lavissimæ, epidermide luteo-virescente nitidissima tectæ, denticulis cardinalibus utrinque 12—16. Long. usque ad 12 mm. (Sars.)

TYPE in Museum Christiania. Type locality, Vadso, Norway.

RANGE. Bering Sea to Norton Sound, Circumboreal.

Genus **PLEURODON** S. Wood, 1840.

This very remarkable little genus combines characters which recall *Nucula, Limopsis, Tindaria,* and other genera, with features peculiar to itself. The typical species is characterized by a shell externally resembling *Nucula,* but having a structure much less nacreous. The anterior side of the hinge line is short, the cardinal border externally is produced and angulated, and in an excavation under this little angle lies the ligament which in a normal and perfectly preserved specimen is nearly or quite covered by the margin of the valves. In most specimens this covering, being extremely thin, is eroded or broken away, so that two valves in opposition show a small oval pocket in which the ligament was originally contained. . . . The cardinal plate in all the species is rather broad and terminates in the left valve with a prominent lateral tooth which is received into a corresponding depression in the plate of the opposite valve, the edge

of the plate in most of the species being turned up like a tooth. The cardinal teeth between the ligamentary fossette and the lateral tooth or socket vary in form and arrangement in each species. (Dall.)

TYPE. *Pleurodon ovalis* Wood.

DISTRIBUTION. California to Gulf of California.

Subgenus CYRILLA A. Adams, 1860

Pleurodon munitum (Carpenter) Dall, 1898.

Trans. Wagner Inst., 3; part. 4: 602.

In this species the fossette has become still larger than in *Cyrilla sulcata*. None of the anterior cardinal teeth is left. The four posterior cardinals are of the bent or V-shaped variety, and the cardinal plate and shell have become more solid and heavy. The ligament is wholly internal and the cardinal plate solid and flat. The wing-like expansions of its outer margin, so notable in all true species of *Pleurodon* are gone. (Dall.)

TYPE in U. S. N. M.? Type locality, off Catalina Island, California.

RANGE. Santa Barbara Islands to the Gulf of California.

Genus **MALLETIA** Desmoulins, 1832.

Shell oval, compressed, smooth or concentrically furrowed, epidermis olive; ligament external, elongated, prominent; hinge with an anterior and posterior series of fine sharp teeth; interior subnacreous; pallial sinus large and deep; anterior adductor giving off a long oblique pedal line. (Tryon. S. S. Conch.)

TYPE. *Malletia norrisii* (Sby.)=*chilensis* Desm.

DISTRIBUTION. United States, Valparaiso, New Zealand.

RANGE IN TIME. Miocene, Patagonia.

Malletia talama Dall, 1916.

Proc. U. S. N. M., **52**:400.

Shell large, thin, plump, of a uniform oval, with a brilliant, smooth light yellowish-olive periostracum; beaks low, near the anterior third with about 8 V-shaped teeth in front of them; on the hinge line and about 36 much smaller teeth behind them; the latter are not obviously V-shaped, are very uniform in size and appearance; the hinge line is thickened under the anterior teeth, but the ligament is strictly external. The shell is slightly wider and more compressed behind but the difference is very small. Length, 23; height, 15; diameter, 10 mm. (Dall.)

TYPE in U. S. N. M., No. 225384. Type locality, Station 3603 off Pribiloff Islands, Bering Sea, in 1771 fathoms.

RANGE. Bering Sea to Oregon.

Malletia pacifica Dall, 1897.

Plate 13, fig. 17.

Nat. Hist. Soc. Brit. Col. Bull. No. **2**:11; pl. 2, fig. 11.

Shell thin, inequilateral, gaping, elongate-ovate, with a brilliant olive-yellow periostracum, showing zones of lighter and darker color, and smooth inflated valves; beaks low, anterior nearly reaching the anterior third; surface marked by obsolete incremental lines, and behind, with obscure radial depressions; base arcuate, anterior end acutely rounded, anterior dorsal margins vertical, pouting, somewhat gaping; anterior part of the shell more inflated, posterior more compressed, posterior ventral margin waved, posterior end obscurely obliquely truncate, posterior dorsal margin straight with a long very narrow black ligament, which is continuous between and for a short distance in front of the beaks; pedal and siphonal gape conspicuous; interior bluish white, pallial sinus extremely shallow; hinge plate very narrow, the anterior teeth larger, much more crowded, about 12 in number; posterior teeth very small, about 45 in all. Length, 30; height, 17; diameter, 10 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Clarence Strait, Alaska.

RANGE. Chignik Bay, Alaska, to Monterey, California.

Malletia faba Dall, 1897.

Plate 13, fig. 16.

Nat. Hist. Soc. Brit. Col. Bull. No. **2**:10; pl. 2, fig. 10.

Shell ovate, smooth, slightly inequilateral, inflated, thin, covered with yellowish olive, brilliantly polished periostracum; beaks full, but not elevated, nearer the posterior end; anterior end rounded, dorsal and ventral margins nearly parallel, posterior end shorter, slightly more pointed; surface smooth or marked only by feeble lines of growth; a feeble impressed line may be regarded as the boundary of a lanceolate escutcheon, which is not impressed; internally bluish white, a small high pallial sinus reaches nearly to the vertical of the beaks; hinge plate very narrow, the ligament very small and black, is wholly external and posterior; there are about nine small posterior teeth, the anterior teeth are still smaller and shorter and number about 32. Length, 22.5; height, 13; diameter, 9 mm. (Dall.)

TYPE in U. S. N. M., No. 122569. Type locality, off Sea Lion Rock, Washington.

RANGE. Queen Charlotte Islands, British Columbia, to Lower California.

Malletia fiora Dall, 1916.

Proc. U. S. N. M., **52**:400.

Shell small, thin, inequilateral, smooth, polished, pale olivaceous, somewhat compressed, the beaks at 4 mm. behind the anterior rounded

end; the base evenly arcuate, the dorsal slopes nearly straight; near the posterior end the profile is obliquely attenuated above and below, terminating in a point; ligament distinctly external with about 10 anterior, and more numerous posterior teeth. Length, 10.5; height, 5.5; diameter, 3 mm. (Dall.)

TYPE in U. S. N. M., No. 207251. Type locality, Station 2859, southwest of Sitka Bay, in 1569 fathoms.

RANGE. Known only from the type locality.

Genus **TINDARIA** Bellardi, 1875.

Shell thick, globose, oval, closed, beaks swollen; anterior teeth stronger, but the posterior row longer. (Tryon. S. S. Conch.)

TYPE. *Tindaria arata* Bellardi.

DISTRIBUTION. Bering Sea to Lower California. Fossil in the Pliocene of Italy.

Tindaria californica Dall, 1916.

Plate 3, fig. 3.

Proc. U. S. N. M., **52**:400.

Shell small, olivaceous, darker distally, inflated, smooth except for incremental lines, polished, swollen, inequilateral; beaks inconspicuous, with a large escutcheon bounded by an angle of the surface, but no lunule; anterior end rounded, plump, 4 mm. in front of the beaks; posterior end attenuated, bluntly rounded, and slightly recurved, the posterior dorsal slope being somewhat concave; the base evenly arched; hinge with 12 anterior and 18 posterior teeth; ligament strictly external, pallial sinus deep. Length, 10; height, 6; diameter, 4.5 mm. (Dall.)

TYPE in U. S. N. M., No. 96972. Type locality, Station 2840 off Santa Barbara Islands, California, in 276 fathoms mud.

RANGE. Santa Barbara Islands to San Diego, California.

Tindaria brunnea Dall, 1916.

Plate 3, fig. 4.

Proc. U. S. N. M., **52**:401.

Shell small, inflated, solid, subtriangular, of a warm yellow brown color; beaks large, prominent, with no distinguishable lunule or escutcheon, the ligament short but wholly external and behind the beaks; the surface sculptured with rather regular fine incremental lines which, toward the margin, appear almost like concentric ripples; there are also very faint radial lines on some parts of the shell; base arcuate, dorsal slopes nearly straight, anterior end rounded, posterior rather bluntly pointed; hinge with about eight anterior and fourteen posterior teeth. Length, 7.5; height, 6; diameter, 4 mm. (Dall.)

TYPE in U. S. N. M., No. 226333. Type locality, Station 3604, Bering Sea, in 1401 fathoms.

RANGE. Bering Sea to Tillamook, Oregon.

Tindaria ritteri Dall, 1916.

Proc. U. S. N. M., **52**:401.

Shell small, plump, smooth except for incremental lines brilliantly polished, pale olive, darker near the margin, rounded in front, inequilateral, slightly recurved and bluntly pointed, and attenuated behind; beaks low, ligament very short and wholly posterior, 10 or 11 slender V-shaped teeth on either side. Length, 7; height, 4; diameter, 2.6 mm., the beaks, 2.5 mm. behind the anterior end. (Dall.)

TYPE in U. S. N. M., No. 209396. Type locality, Station 4325, off La Jolla, California, in 293 fathoms.

RANGE. Known only from the type locality.

Tindaria martiniana Dall, 1916.

Proc. U. S. N. M., **52**:401.

Shell small, solid, olivaceous, inflated, subtriangular, inequilateral, the beaks nearer the anterior end; sculpture of fine concentric and still finer radial striæ only visible under magnification; beaks full, incurved, 3.5 mm. from the anterior end, a small lanceolate lunule and a narrower and longer escutcheon are indicated only by the brown color of their areas against the pale olive of the shell; shell rounded in front, pointed bluntly behind, the base arcuate, the dorsal slopes nearly straight; hinge with 14 anterior and 16 posterior slender teeth, the ligament entirely external and posterior. Length, 8.6; height, 6.5; diameter, 5 mm. (Dall.)

TYPE in U. S. N. M., No. 207318. Type locality, Station 4425, off Santa Barbara Islands, California, in 1100 fathoms.

RANGE. Cape San Martin to the Santa Barbara Islands, in deep water.

Tindaria dicofania Dall, 1916.

Proc. U. S. N. M., **52**:401.

Shell small, olivaceous, callistiform, arcuate, with swollen beaks, concentrically uniformly sculptured, nearly equilateral, the anterior end shorter; a small lanceolate lunule and escutcheon present; both rounded, base conspicuously arcuate, the posterior end slightly attenuated; about 11 teeth on each side of the hinge, the ligament wholly external. Length, 4.5; height, 3.2; diameter, 2 mm. (Dall.)

TYPE in U. S. N. M., No. 215595. Type locality, Station 2923, off San Diego, California, in 822 fathoms.

RANGE. Known only from the type locality.

Tindaria cervola Dall, 1916.

Proc. U. S. N. M., **52**:402.

Shell small, thin, sub-triangular, of a uniform olive color, finely uniformly concentrically sculptured, with a few microscopic radial striulæ; base conspicuously arcuate, dorsal slopes nearly straight, the anterior slope shorter, the anterior end rounded, the posterior bluntly pointed, an extremely narrow and small lanceolate lunule and escutcheon, present; beaks conspicuous, the prodissoconch visible, whitish; about 10 anterior and 14 posterior teeth, the ligament small, wholly posterior. Length, 4; height, 2.7; diameter, 2 mm. (Dall.)

Type in U. S. N. M., No. 215594. Type locality, Station 2923, off San Diego, California, in 822 fathoms.

Range. Off San Diego, California, in deep water.

Tindaria gibbsii Dall, 1897.

Plate 43, fig. 2.

Nat. Hist. Soc. Brit. Col. Bull. No. **2**:10; plate 2, fig. 14.

Shell small, thin, sub-equilateral, inflated, with a polished pale olive periostracum and smooth surface; anterior end shorter, rounded; posterior end very slightly recurved; beaks full, not arcuate, base arcuate; ligament wholly external, amphidetic, discontinuous below the beaks; interior bluish white, with a large rounded pallial sinus; anterior teeth 17, posterior 19, the line separated by a vacant triangular space on the hinge plate below the beaks. Length, 10; height, 6.5; diameter, 3.5 mm. (Dall.)

Type in U. S. N. M. Type locality, off Queen Charlotte Islands, British Columbia.

Range. Queen Charlotte Islands to the Coronado Islands.

Tindaria mexicana Dall, 1908.

Plate 39, figs. 6, 7.

Bull. Comp. Zool., **42**:389; plate 17, figs. 11, 14.

Shell small, solid, round-triangular, sub-equilateral, olivaceous, polished; beaks prominent, prosocœlous, slightly anterior, inflated, concentrically minutely threaded; the sculpture extends to the middle of the base, is a little less conspicuous on the dome of the valve and almost entirely absent near both ends, ceasing rather abruptly; anterior slope short with no lunule, the anterior end rather attenuated, rounded; posterior end longer somewhat attenuated, the dorsal slope flattish, the end rather abruptly rounded; base roundly arcuate; ligament minute, amphidetic; anterior hinge line with 11, posterior with about 21 teeth, the central ones small and obscure; interior porcellaneous. Length, 5.2; height, 4; diameter, 2.3 mm, beaks behind the anterior end, 2 mm. (Dall.)

TYPE in U. S. N. M., No. 122929. Type locality, U. S. S. Albatross station, 3418, off the Mexican coast, in 660 fathoms.

RANGE. San Diego, California, to Acapulco, Mexico, in deep water.

Tindaria kennerlyi Dall, 1897.

Plate 1, fig. 6.

Nat. Hist. Soc. Brit. Col. Bull. No. **2**:11; plate 2, fig. 9.

Shell small, cythereiform, plump, with a yellowish periostracum; beaks full, rather prominent; valves nearly equilateral, rounded before and behind, base regularly arcuate; surface uniformly sculptured with rounded narrow, equal close-set small concentric riblets; lunule and escutcheon obscure or none; interior white, the pallial line hardly sinuate; ligament short, external, opisthodetic; hinge plate and teeth rather strong, anterior teeth about 12, posterior 14, the series hardly interrupted. Length, 6.5; height, 5; diameter, 4 mm. (Dall.)

TYPE in U. S. N. M. Type locality, off coast of Washington.

RANGE. Off Sitka, Alaska, to the Santa Barbara Islands, in deep water.

Family ARCIDÆ.

Genus **GLYCYMERIS** Da Costa, 1778.

Shell orbicular, nearly equilateral, smooth or radiately striated; umbones central, divided by a striated ligamental area; hinge with a semi-circular row of transverse teeth; adductors sub-equal; pallial line simple; margins crenated inside. (Tryon. S. S. Conch.)

TYPE. *Arca glycymeris* (Linn).

DISTRIBUTION. West Indies, Britain, India, New Zealand, West America.

Glycymeris septentrionalis Middendorff

Mal. Rossica, **3**:67; plate 21, figs. 1–3.

Shell of medium size, nearly circular, convex, thick; umbones central, not prominent; surface sculptured with rather faint ridges of growth and radiating grooves, which are more or less interrupted by the ridges; triangular ligamental area between umbones divaricately striated; hinge with a semi-circular row of transverse teeth; muscle impressions subequal; interior of margin crenulated. Length, 30; height, 32.2; diameter, 22 mm. (Arnold.)

TYPE in Academy of St. Petersburg. Type locality, Arctic.

RANGE. Aleutian Islands to Puget Sound. In the Pleistocene at San Pedro, California.

Glycymeris subobsoleta Carpenter, 1864.

Plate 40, figs. 8, 9.

Suppl. Rep. Brit. Assoc., p. 644; *Ann. Mag. Nat. Hist.* (ser. 3), **14**:425.

A. testa A. septentrionali simili, parum inæquilaterali, haud tumida; umbonibus obtusis, latis, satis prominentibus; cinerea, rufo-castaneo varie picta; epidermide copiosa, sublaminata; marginibus ventrali et postico valde rotundatis, antico parum producto, dorsali recto; sulcis radiantibus subobsoletis sculpta, dorsaliter sæpe evanidis; intus marginibus ventrali valde, ant. et post. parum crenatis; lamina cardinis subangulata; dentibus paucioribus, validid, angustatis; cicatr. add. antica castanea, callosa; ligamento sulcato. Long., .13; lat., .12; alt., .7. (Carpenter.)

Shell similar to *G. septentrionalis,* slightly inequilateral, not tumid, umbones obtuse, broad, quite prominent; ash-colored, variegated with reddish chestnut; epidermis thick, somewhat laminated; ventral and posterior margins quite rounded, anterior margin produced, dorsal straight, sculptured by subobsolete radiating grooves, often disappearing dorsally; ventral margin strongly, and anterior and posterior internal margins slightly crenulated; cardinal plate subangular, with a few strong, compressed teeth; adductor scar chestnut colored; ligament furrowed.

TYPE in U. S. N. M. Type locality, Neah Bay, Washington.

RANGE. Aleutian Islands, Alaska, to Cortez Bank, California.

Glycymeris corteziana Dall, 1916.

Plate 3, fig. 7.

Proc. U. S. N. M., **52**:402.

Shell solid, white, with a brownish periostracum, the surface finely concentrically sculptured, with less conspicuous fine radiating striæ, on which the periostracum exhibits ciliated lines; valves moderately compressed, suborbicular, evenly rounded in front and below, somewhat produced behind, the lower margins finely crenulated; beaks small inconspicuous; area very narrow, closely divaricately grooved; hinge plate broad, with about 12 anterior and 16 posterior teeth. Length, 22; height, 20; diameter, 11 mm. (Dall.)

TYPE in U. S. N. M., No. 212431. Type locality, Station 2918, on edge of Cortez Bank, California.

RANGE. Forrester Island, Alaska, to Cortez Bank, California.

Glycymeris migueliana Dall, 1916.

Proc. U. S. N. M., **52**:402.

Shell solid, white, with sparse zigzag lines of reddish brown and internally often with a touch of brown near the posterior margin; surface smooth except for irregularities of growth; valves suborbicular, anterior side slightly longer, posterior hardly produced; beaks low, area small and

divaricately grooved; inner basal margin crenulated; anterior teeth 10–14, posterior 9–12; valves moderately convex. Length, 23; height, 22; diameter, 14 mm. (Dall.)

TYPE in U. S. N. M., No. 120775. Type locality, Station San Miguel Island, California.

RANGE. Cape Blanco, Oregon, to Magdalena Bay, Lower California.

Genus **LIMOPSIS** Sassi, 1827.

Shell orbicular, convex, slightly oblique; ligamental area with a triangular cartilage-pit in the center; hinge with 2 equal, curved series of transverse teeth. (Tryon. S. S. Conch.)

DISTRIBUTION. Red Sea, Japan, Britain, Finland and United States.

Limopsis skenea Dall, 1916.

Proc. U. S. N. M., **52**:402.

Shell small, finely reticulately sculptured, with a long-haired velvety periostracum; narrow, high, rather inflated, thin, whitish under the brown periostracum; beaks small, area small, hinge line short, with one outer large and one or two small inner teeth on each side of the resilifer. General form oblique. Length, 7; height, 9.2; diameter, 6.5 mm. (Dall.)

TYPE in U. S. N. M., No. 205883. Type locality, Station 4471, Bowers Bank, Bering Sea, in 30 fathoms.

RANGE. Known only from the type locality.

Limopsis akutanica Dall, 1916.

Proc. U. S. N. M., **52**:403.

Shell white, with a golden brown long-haired periostracum, the surface concentrically somewhat irregularly sculptured, the ridges crossed by finer, closer, less conspicuous striæ; disk ovate, compressed, with inconspicuous beaks, a very small narrow area and a relatively large resilifer; the inner margins are flat; the hinge plate narrow, with about 7 posterior and 9 anterior teeth; interior of disk finely radiately striate. Length, 21; height, 18; diameter, 8 mm. (Dall.)

TYPE in U. S. N. M., No. 224263. Type locality, Station 2842, southeast of Akutan Island, Aleutians, in 72 fathoms.

RANGE. Known only from the type locality.

Limopsis diegensis Dall, 1908.

Plate 29, figs. 6, 7.

Bull. Mus. Comp. Zool., **43**:395; plate 15, figs. 13, 15.

This small, oblique-ovate, and rather swollen species is light brown, rather sparsely pilose, thin, with a small resilium, about seven anterior and

four to five posterior hinge teeth, which are small and delicate, the two series separated by a short edentulus gap. When the periostracum is removed, the sculpture is not unlike that of *L. jousseaumi,* but more emphatic, and the radii are distinctly punctate. The interior is faintly grooved and the ventral margin distinctly crenulate, or rather beaded. Length, 12; height, 10; diameter, 11 mm. (Dall.)

TYPE in U. S. N. M., No. 122585. Type locality, Station off San Diego, California, in 822 fathoms.

RANGE. Santa Barbara Islands to Coronado Islands.

SECTION EMPLECONIA Dall, 1908.

Limopsis vaginatus Dall, 1891.

Plate 14, figs. 2, 3.

Proc. U. S. N. M., **14**:190 and **17**; plate 25, figs. 3, 6, 7.

Shell large, ovate, with a dense brown hirsute epidermis, under which the valve is polished, radiately and concentrically striated; margin simple, polished, central part of the valves striate radiately, the muscular scars bounded inwardly by a radial elevated ridge, most prominent behind the anterior scar. Hinge with ten anterior and five posterior teeth, separated by a gape, beaks little elevated, ligament wide, subtriangular and black; behind the hinge the cardinal margin is deeply folded in, forming when the valves are shut a long, very narrow pit more than one-fourth as deep as the whole width of the shell at right angles to that margin; this pit is also densely hirsute. The outline of the shell margin is thus made reniform. Length of shell with epidermis, 34; height at right angles to the hinge line, 30; diameter, 12 mm. Length of pit, 16 and depth, 5.5 mm. (Dall.)

TYPE in U. S. N. M., No. 122547. Type locality, Station 3330, off the coast of Unalaska Island, Bering Sea, in 351 fathoms.

RANGE. Bering Sea and Aleutian Islands.

Genus **ARCA** Linnæus, 1758.

Shell equivalve or nearly so, thick, sub-quadrate, ventricose, strongly ribbed or cancellated; margins smooth or dentated, close or sinuated ventrally; hinge straight, teeth very numerous, transverse; umbones anterior, separated by a flat, lozenge-shaped ligamental area, with numerous cartilage grooves; pallial line simple; posterior adductor impression double; pedal scars 2, the posterior elongated. (Tryon. S. S. Conch.)

TYPE. *Arca noæ* Linn.

DISTRIBUTION. World wide, most abundant in warm seas.

Subgenus BARBATIA Gray, 1847.

SECTION FOSSULARCA Cossmann, 1877.

Arca solida Brod. and Sowerby, 1833.

Proc. Zool. Soc., 1833. *Conch. Iconica*, **2**; plate 16, fig. 106.

Shell ovately square, nearly equilateral, thick, solid, very gibbous, sides rounded, the posterior obtusely angulated, obsoletely keeled; whitish, with scarcely any epidermis; radiately striated, striæ elevated, rather indistinctly and irregularly canellated with minute longitudinal striæ; umbones central; areas of the ligament elongated, somewhat bent inward; ligament diamond-shaped, central. Length, 14; height, 10; diameter, 9.5 mm. (Conch. Iconica.) Described as Byssoarca solida.

TYPE in Museum Cuming. Type locality, Payta, Peru.

RANGE. San Diego, California, to Peru.

SECTION ACAR Gray, 1847.

Arca reticulata Gmelin, 1792.

Syst. Nat., **7**:3311. *Conch. Iconica;* Arca, plate 16, fig. 108.

Shell ovately oblong, anterior side rather angulated at the upper part, posterior rounded, somewhat concavely compressed, with a keel running down from the umbones to the margin; white, with scarcely any epidermis; longitudinally fimbriately ribbed, interstices deeply grooved, crossed with narrow raised ridges; ribs fimbriately spinous on passing over the keel, divaricately rayed across the concave posterior area; area of the ligament narrow, lanceolated posteriorly. This is the description of *A. divaricata* Sowerby, which equals the above species. Length, 6.4 mm. (Sowerby.)

TYPE in Museum Cuming. Type locality, Island of Annaa (Chain Island).

RANGE. San Pedro, California, to Ecuador. Also Atlantic.

Subgenus SCAPHARCA Gray, 1847.

Arca multicostata Sowerby, 1833.

Proc. Zool. Soc., 1833. *Conch. Iconica*, **2**; plate 4, fig. 23.

Shell squarely rhomboid, solid, equivalve; sides attenuated and angulated at the upper part, anterior side shorter, ventricosely rounded beneath, posterior angularly extended downward; ivory white, covered over with a brown horny epidermis, which is a little velvety between the ribs; radiately ribbed, ribs about six-and-thirty in number, rather narrow, rounded, smooth, anterior ribs slightly granulous; area of the ligament rather broad; umbones somewhat approximated. Length, 100; height, 80; diameter, 76 mm. (Sowerby.)

TYPE in Museum Cuming. Type locality, Gulf of Tehuantepec, Central America.

RANGE. San Diego, California, to the Gulf of Tehuantepec.

SECTION BATHYARCA Kobelt, 1891.

Arca nucleator Dall, 1908.

Bull. Museum Comp. Zool., **18**, No. 6:397; pl. 18, fig. 9.

Shell small, plump, subglobular, inequilateral, white, with a dense villous periostracum; beaks full, prominent, adjacent, overhanging a long narrow amphidetic area; anterior part of the straight hinge line shorter than the posterior, each making an angle with the beginning of the valve margin which forms a slightly oblique subcircular arc, the posterior end being more rotund; sculpture very and subequally recticulate, the radial and concentric raised lines alike bearing long purpuraceous fringes of periostracum; hinge line not quite as long as the shell, the anterior part carrying six radiating minute teeth, the posterior part eight, which are somewhat more nearly horizontal; interior of the valve smooth, whitish, margins entire. Length, 6; height, 6; hinge line, 5; diameter, 4 mm. (Dall.)

TYPE in U. S. N. M., No. 122876. Type locality, Station 3392, Gulf of Panama, in 1270 fathoms.

RANGE. San Diego, California, to Panama.

Arca pompholyx Dall, 1908.

Bull. Comp. Zool., **43**:398.

Differs from *A. corpulenta* in that the beaks are larger, fuller, and more conspicuous; the sculpture is composed of narrow, flat, smooth, concentric bands much wider than the radiating liræ, which are only visible in the interspaces and do not nodulate the intersections; in comparing an umbonal view of the present shell with the figure in the Challenger Report, the beaks of the specimen are much nearer the anterior end of the hinge line than in the figure. These lead me to think that the two may be distinct, or at least distinguishable varieties, as the specimens I have seen show variations. Length, 23.5; height, 26; diameter, 22; hinge line, 16.5; with the beaks, 4.5 mm. (Dall.)

TYPE in U. S. N. M., No. 110704. Type locality, off Santa Barbara, California.

RANGE. Off Santa Barbara, California, to the Galápagos Islands, deep water.

Family PINNIDÆ.

Genus **ATRINA** (Gray) Adams, 1857.

Shell with the apical portions of the valves entire. (Gray.) The valves unisulcate or without the median carina, and the internal nacreous

layer is entire. The type is *P. nigra* Ch. and it is represented in our recent fauna by *P. rigida* Dillwyn and *P. serrata* Sowerby. (Dall, 1895.)

TYPE. *Pinna nigra* Ch.

Atrina oldroydi Dall, 1902.

Plate 28, fig. 12.

The Nautilus, **14**:143. *U. S. N. M. Bull.,* **112**; pl. 2, figs. 4, 5, 6.

Shell solid, heavy, blackish gray, subtriangular, rather inflated; umbonal end slender (somewhat defective in the specimen); hinge margin straight; ventral margin contracted in front, convexly arcuate behind; posterior margin arched; exterior smooth, except for more or less concentric wrinkling on the ventral side and numerous rather fine imbricate elevated ridges (about 38) radiating from near the umbo on the dorsal and middle portions of the valve, not extending to the ventral surface and obsolete over the distal valve; the scales or spines are worn off, but appear to have been numerous and small; interior of a livid dark olive gray, with a lurid iridescence over the visceral area, the ventral edge of which extends in a zigzag line almost directly anterior from the ventral edge of the rather small adductor scar, leaving more than a third of the ventral surface of the valve exterior to the visceral area. Length of ventral margin, 238; of dorsal margin, 175; of the distal margin, 156; maximum diameter of the valves, 63 mm. Length of the visceral area from the umbo, 172 mm. The byssus is quite small and of a dark blackish brown color. The form of the visceral area, which in these shells is generally regarded as a pretty constant character, is entirely different from that of any of the other described Pacific coast species. (Dall.)

TYPE in the Oldroyd collection, Stanford University, No. 117. Type locality, off San Pedro, California, in 25 fathoms.

RANGE. San Pedro Bay, California, in deep water.

Family PTERIIDÆ

Genus **PTERIA** Scopoli, 1777.

Shell obliquely oval, very inequivalve, eared, the posterior ear produced, wing-like; right valve with a byssal sinus beneath the anterior ear; cartilage pit single, oblique; hinge with one or two small cardinal teeth, and an elongated posterior tooth, often obsolete; posterior muscular impression (adductor and pedal) large, subcentral; anterior (pedal scar) small, umbonal. = *Avicula* Lamarck, 1799. (Tryon. S. S. Conch.)

TYPE. *Mytilus hirundo* L.

DISTRIBUTION. Mexico, South Britain, Mediterranean, India, Pacific.

RANGE IN TIME. Lower Silurian, a few in the Tertiary, Eocene, Oligocene, Miocene.

Pteria viridozona Dall, 1916.

Proc. U. S. N. M., **52**:403.

Shell small, oval, translucent, sea-green, distributed in narrow darker and lighter zones, sculptured with narrow, very elongate, opaque, whitish scales, distributed in radiating lines with wider bare spaces between them; right valve smaller and flatter with a sinus for the byssus; left valve larger with the anterior ear compressed but not sinuate; the hinge line shorter than the shell with a shallow rounded sinus between the posterior ear and the body of the disk; interior with the pearly area small and no denticulations on the hinge line. Length, 25; height, 13; diameter, 5 mm. (Dall.)

TYPE in U. S. N. M., No. 172600. Type locality, Long Beach, California.

RANGE. Known only from the type locality.

Pteria sterna Gould, 1851.

Plate 40, fig. 3.

Proc. Boston Soc. Nat. Hist., **4**, p. 93, and **6**, p. 404. Mex. and Cal. Shells; pl. 16, fig. 7.

Shell rather solid, obliquely ovate, triangular, with a very long slender, acuminate cauda, and well marked auricles; color dark mahogany brown, with a few paler radiations; surface compactly striate, covered with a thin, dirty, cinerous epidermis, very delicately fringed with radiating series of minute processes, especially in the vicinity of the byssal notch and at margin. Beaks near the anterior fourth, prominent, oblique, the posterior umbonal slope tumid, and in the left valve limited by an obtuse groove, a submarginal angle along the cauda; auricles radiately striate. Auricle of right valve trapezoidal, widening toward the tip and obliquely truncate; byssal notch deep and acutangular; auricle of left valve subtriangular, as broad as long, the byssal fold prominent. Hinge with a well marked cardinal and lateral tooth in left valve. Nacre silvery and highly iridescent; margin like the tortoise shell. Length of hinge margin, two and a half inches; diameter of wing, one and one-fourth inches; breadth, five-eighths of an inch.

TYPE in Boston Soc. Nat. Hist. Type locality, Mazatlan, Mexico.

RANGE. San Diego, California, to Panama.

Genus **PEDALION** Solander, 1770.

Shell nearly equivalve, compressed, subquadrate; area wide, cartilage pits numerous, elongate, close-set; right valve with a byssal sinus; muscular impression double. = *Perna* Brugière, 1792. (Tryon. S. S. Conch.)

TYPE. *P. ephippium* Linn.

DISTRIBUTION. Tropical Seas, West Indies, India, West America.

RANGE IN TIME. Trias in the United States, Chile, Europe.

Pedalion chemnitzianum Orbigny, 1845.

Moll. Cuba, **2**:346; *Conch. Cab.*, **7**:59, fig. 580.

Testa oblonga, transversa, depressa, albida, concentrice, lamellosa, irregulariter gradato-squamosa; latere pelleali elongato, producto. Long., 30 mm. (Orbigny.)

TYPE. Location of type and type locality unknown to the present writer.

RANGE. Coronado Islands to Panama and Chile. Also Atlantic.

Family PHILOBRYIDÆ.

Genus **PHILOBRYA** Carpenter, 1872.

Shell like a minute *Pinna*, with pointed beaks; upper margin straight, with a strong internal ligament, anteriorly at the byssal sinus somewhat insinuated, ventrally and posteriorly rounded and gaping; posterior muscular scar subcentral, indistinct. (Tryon S. S. Conch.)

TYPE. *Bryophila setosa* Carpenter.

DISTRIBUTION. Forrester Island, Alaska, to Cape San Lucas, Lower California.

Philobrya setosa Carpenter, 1864.

Plate 54, figs. 32 to 35.

Ann. Mag. Nat. Hist. (ser. 3), **13**:314; *Jour. de Conchol.*, **45**; pl. 1, fig. 1.

B. testa parva, regulari; cinerea, salmoneo seu chocolateo, intus subnacreo, exquisite tincta; t. juniore planata, semirotundata, dorsaliter recta, æquilaterali, conspicue punctata: t. adolescente subdiaphana: t. adulta solidiore; umbonibus rectus, terminalibus, intus alte excavatis; marg. dorsali breviore, recto; antico recto; ventrali et postico late rotundatis; extus epidermide subspongiosa vestita, radiis setarum subdistantibus, marginibus eleganter pectinatis: intus ligamento solido dorsaliter producto; limbo pallii æqualiter prope marginemdecurrente; cicatr. adduct. submediana, inconspicua postice hiante; antice propter byssum tenuem sinuata. (Carpenter.)

Shell small, regular; ash-colored, salmon or chocolate. Inside somewhat pearly, with exquisite tints. Young shells flat, half round, straight along the back, equilateral, and conspicuously dotted. Nearly full grown shells rather transparent; adults rather solid with straight umbos, which are terminal deeply hollowed inside. Dorsal margin rather short and straight. Front edge straight; ventral and posterior margins widely

rounded. Externally the shell is clothed with a rather spongy epidermis; with somewhat distant rows of bristles which form an elegant comblike fringe at the edges. Inside the solid ligament is stretched along the dorsal edge; the mantle marking runs down from it to an even distance from the edge of the shell. The scar of the adductor muscle is near the center and not conspicuous. The posterior end is gaping; the front is wavy on account of the slender byssus. (A free translation.) Length, 13; width, 2; height, 2 mm.

TYPE in U. S. N. M. Type locality, Cape San Lucas, Lower California.

RANGE. Forrester Island, Alaska, to the Gulf of California.

Family OSTREIDÆ.

Genus **OSTREA** Linnæus, 1758.

Shell irregular, attached by the valve; upper valve flat or concave, often plaited or foliaceous, and with a prominent beak; ligamental cavity triangular or elongated; hinge toothless; structure subnacreous, laminated, with prismatic-cellular substance between the margins of the laminæ. (Tryon. S. S. Conch.)

TYPE. *Ostrea edulis* Linn.

DISTRIBUTION. Tropical and temperate seas.

RANGE IN TIME. Carboniferous to Pleistocene.

Ostrea lurida Carpenter, 1864.

Plate 37, figs. 10a, 10b.

Suppl. Rep. Brit. Assoc., p. 646; *Jour. de Conchol.*, 12:138.

O. t. irregulari, suborbiculari, ellipsoidea, seu producta; superficie interdum laminata, purpurea seu squalide grisea, haud, costata: intus olivacea, interdum purpureo tincta, seu omnino purpurea, submargaritacea; cardine recto; umbonibus haud conspicuis, haud excavatis; margine interno, cardinem versus sæpe crenulato. (Carpenter.)

TYPE in U. S. N. M. Type locality, Vancouver Island.

RANGE. Sitka, Alaska, to Cape San Lucas, Lower California. In the Pleistocene at Benicia, Solano County, and San Pedro and San Diego, California.

Ostrea lurida expansa Carpenter, 1864.

Suppl. Rep. Brit. Assoc., p. 646; *Jour. de Conchol.*, 12:138.

T. omnino planata, per totum superficiem affixa; extus, marginem versus laminata, purpureo radiata; intus, olivaceo-rufa, ligamento parvo, in medio undato, solidiore. (Carpenter.)

TYPE in U. S. N. M. Type locality, San Pedro, California.

RANGE. Monterey to San Diego, California.

Ostrea palmula Carpenter, 1857.

Mazatlan Catalogue, p. 163.

O. ? conchaphila, t. satis magna, margine subito ascendente, valva inferiore superante, undulato, limbo purpureo seu olivaceo irregulariter tessellato; linea pustularum valva superiore, in parte nacrea, a margine remota, circumeunte, in puncta convenientia valva inferiore aptante; pagina interna subnacrea, aurantio seu purpureo tincta; rarissime spinis ramosis paucis, tabulis ad marginem exteriorem arborescentibus. Length, 2.3; lat., 1.6; alt., .54 inches. (Carpenter.)

Remarks by P. P. Carpenter: Remarkable for the palmated foliations in the outer margin, which has a distinct limb mottled with purple and olive; and for the row of denticles within this limb and within the nacreous border, fitting into corresponding depressions in the other valve. As these seem to appear only in the adult shell, it is barely possible that *O. conchaphila* may occasionally develop itself into this form.

TYPE in Liverpool Collection. Type locality, S. W. Mexico.

RANGE. Puget Sound to Cape San Lucas, Lower California.

Family PECTINIDÆ.

Genus **PECTEN** Müller, 1776.

Shell suborbicular, regular, resting on the right valve, usually ornamented with radiating ribs; beaks approximate, eared; anterior ear most prominent; posterior side a little oblique; right valve most convex, with a notch below the front ear; hinge-margin straight, united by a narrow ligament; cartilage internal, in a central pit; adductor impression double, obscure; pedal impression only in the left valve, or wanting. (Tryon. S. S. Conch.)

TYPE. *Ostrea maxima* Linn.

DISTRIBUTION. World wide, Nova Zembla to Cape Horn.

RANGE IN TIME. Devonian to the present.

Subgenus PECTEN s. s.

Pecten diegensis Dall, 1898.

Plate 29, fig. 5, and plate 41, fig. 3.

Pecten floridus Hinds, *Zool. Sulph. Voy.,* p. 60; pl. 17, fig. 6 (1844). Not *Ostrea* (*Pecten*) *floridus* Gmelin (1792).

Shell rather elongately ovate, equilateral, inequivalve; valves compressed, concentrically finely striated, rayed with 18 ribs; left valve flat, slightly convex in the middle, with the ribs much raised, narrow, angled in the middle; right valve convex, with the ribs much raised, prominent,

angulated on each side, grooved down the middle; left valve rose-brown, obscurely spotted, right valve paler, unspotted; ears equal. (Dall.)

TYPE in U. S. N. M. Type locality, San Diego, California.

RANGE. Monterey to San Diego; Cortez Bank. In the Pleistocene at San Diego, California.

Subgenus CHLAMYS Bolten, 1798.

Pecten hericius Gould, 1850.

Plate 7, figs. 1, 2.

Proc. Boston Soc. Nat. Hist., 3:345; Arnold, *Tert. Pectens Cal.*, pl. 43, figs. 3, 3a.

Shell triangular ovate, longer than broad, equivalve; valves rather full, especially near the beaks, whose sides rise abruptly from the ears; color rose-red, paler and zoned with deeper red beneath; everywhere covered with fine radiating lines, which are rendered rough by erect and arched spines. There are about twenty-four radiating ribs. On the upper sides these are alternately large and small, the larger ones crowned along the ridge by a line of long, erect, hollow spines; on the lower valve the ribs are nearly equal, the striæ are coarser, and all the ribs are armed with a row of spines, though not so long as those on the upper valve; ears oblique, very unequal, rayed with coarse, squamous striæ. Interior porcelain-white, roseate at the edge, where it is finely crenulate. Length, 73; height, 65; diameter, 21 mm. (Gould.)

TYPE in Boston Soc. Nat. Hist. Type locality, Strait of Juan de Fuca.

RANGE. Port Althorp, Alaska, to San Diego, California.

Pecten (hericius Gould var.?) **albidus** Dall, 1906.

Plate 12, figs. 8, 9.

Arnold, *Tert. Pectens Cal.*, p. 136; pl. 52, figs. 2, 2a.

Shell of the same shape and general appearance as *P. hericius*, but smaller when adult, being only about 45 mm. in altitude. The sculpture on the right valve consists of numerous elevated, narrow, thread-like, imbricated riblets, which have the appearance of being grouped together in three or more unequal equidistant, more or less convex fasciculi; the interspaces between the fasciculi are ornamented by riblets of equal prominence to those forming fasciculi; anterior ear with about 7 equal, prominently imbricated radials; posterior ear short and with radial and imbricating sculpture; byssal notch quite prominent. Left valve similar to right, but with the fasciculi corresponding to the interspaces of the right valve, and consequently much narrower than the fasciculi of that valve. Color white to very light pink. Length, 40; height, 45; diameter, 14 mm. (Dall.)

TYPE in U. S. N. M., No. 150207. Type locality, Station 3313, Iliuliuk Harbor, Unalaska, in 68 fathoms.

RANGE. Aleutian Islands.

Pecten hastatus Sowerby, 1843.

Plate 29, figs. 1, 3.

Thes. Conch. Pecten, p. 72; pl. 20, fig. 236.

Shell oval, inclining to triangular, rather elongated, rough, with very unequal ears, the posterior ones being very small; the upper valve has eight unequal, elevated, angular ribs, with numerous erect, slightly curved, sharp spines, and several smaller spinose ribs in the interstices. The lower valve has 22 more nearly equal ribs, with more numerous and smaller spines on the angle. Long. 54; alt., 61; hinge, 28 mm. (Sowerby.)

TYPE in Cuming Coll. Type locality not given.

RANGE. Monterey to San Pedro, California.

Pecten hindsii Carpenter, 1864.

Plate 7, figs. 3, 4.

Suppl. Rep. Brit. Assoc., p. 645. Arnold, *Tert. Pectens Cal.,* pl. 43, figs. 1, 2.

Shell smaller than *P. hericius,* margins smooth. Right valve with about 26 close-set, sometimes wide, flattish, usually dichotomus, smooth ribs, which show fine lines of growth on their surface; interspaces narrow, channeled, and sculptured by minute reticulations; hinge line one-half as long as disk; anterior ear produced, sculptured by about six radials and prominently imbricating concentric lines; byssal notch prominent; posterior ear small and with radial and imbricating concentric sculpture. Left valve with small, obscurely fasciculated, imbricated ribs, each fascicle having one major and several much smaller and more prominently imbricated riblets; interspaces very narrow and sculptured as in the right valve; ears similar to those of right valve except lacking notch in anterior one. Color pink to white, the left valve being darker. Length, 57; height, 58; diameter, 18 mm. (Arnold.)

TYPE in British Museum. Type locality unknown.

RANGE. Bering Sea to San Diego, California.

Pecten hindsii kincaidi I. Oldroyd, 1919.

Plate 12, figs. 1, 2.

The Nautilus, 33:135; pl. 4, figs. 3, 4.

Shell suborbicular, the height and length being nearly equal; equivalve, both valves slightly convex; ears as in *P. islandicus;* base evenly rounded; color yellowish white with reddish brown markings. Left valve with 28 narrow round-topped imbricated ribs, and very faint intercallaries, the interspaces wider. Right valve with 25 broader flat-topped ribs, some

of which are divided toward the margin. Anterior ear (the larger) with 7 ribs, the posterior ear with 5 ribs. This species resembles *P. jordani* Arn., but the valves do not tend to contract suddenly at the basal margin as in *P. jordani,* and the right ear is larger. The ribs on the valve of *jordani* are all divided from near the umbones. Length, 38; height, 40; diameter, 13; hinge line, 18 mm. (I. Oldroyd.)

TYPE in Oldroyd Collection, Stanford University, No. 89. Type locality, off San Juan Island, Washington, in 25 fathoms.

RANGE. Puget Sound.

Pecten hindsii navarchus Dall, 1898.

Plate 4, figs. 2, 3.

Hinds, *Voy. Sulphur, Moll.,* pl. 17, fig. 5 (as *Pecten rubidus,* Hinds, 1844, not *Pecten rubidus* Martyn, 1784), Dall, *Trans. Wag. Inst.,* 3: pl. 4, 4,708.

Shell smaller than *P. islandicus;* ribs small, obscurely fasciculated, dichotomous, and imbricated on both valves. (Dall.) Alt., 55.5; long., 54; hinge line, 21; diameter, 17 mm. (Arnold.)

TYPE in Museum Cuming. Type locality, Alaska.

RANGE. Bering Sea to San Diego, California. In the Pleistocene of San Pedro and San Diego, at Pacific Beach, boulder clay of Comox, Vancouver Island, British Columbia.

Pecten islandicus Müller, 1776.

Plate 8, figs. 1, 2.

Prodr. Zool. Danica, p. 248. Arnold, *Tert. Pectens Cal.,* pl. 45, fig. 1.

Shell suborbicular, somewhat higher than long, subequivalve, both valves only slightly convex, equilateral, except for ears; of medium thickness; sides only slightly concave above; base evenly rounded; color of living shell pinkish to salmon, the left valve being the more highly colored. Right valve with numerous narrow, square, flat-topped, imbricated ridges, which multiply slowly, both by division and intercalation, as the shell grows; interspaces narrow, channeled, and minutely reticulated; hinge line equal to more than one-half length of disk; anterior ear much produced, sculptured by numerous sharp imbricating lines and 5 or 6 major radiating ridges and some intercalarie; byssal notch quite prominent; posterior ear a little over one-half as long as the anterior, and sculptured in the same way. Left valve similar to the right, except possibly that the imbrication is a little more pronounced. Length, 77; height, 83; diameter, 27; hinge line, 44 mm. (Arnold.)

TYPE locality, northern seas. Location of type unknown to the present writer.

RANGE. Arctic Ocean, Kamchatka and Puget Sound. Also Atlantic.

Pecten islandicus beringianus Middendorff, 1849.

Plate 41, figs. 1, 2.

Beitr. Mal. Rossica, **3**:12; Arnold, *Tert. Pectens Cal.,* pl. 44, figs. 2–4.

Dem *Pecten islandicus* höchst nahe, und wahrscheinlich nur eine war, *beringiana* desselben. Leider besitze ich nur die Oberschale von dreien Exemplaren, welche im Behrings-Eismeere gesammelt worden; die grösste derselben ist 56 m. lang, um dabei 11 m. hoch, woraus ersichtlich wird, dass der Bauch dieser Oberschalen etwas gewölbter ist, als beim *P. islandicus.* Die Skulptur Gleicht, nur stärker ausgebracht, der Normalskulptur des *P. islandicus,* und zwar wechselt je einer der 25 Hauptstreifen mit einem Zwischenstreifen, in einer Regelmässigkeit, wie das bei keinem der Exemplare jener Art der Fall war. Beiderlei Streifen sind übrigens ganz wie bei *P. islandicus* geschuppt und auch die Zwischenraüme lassen unter der Loupe jene raselähnlichen Schüppchen sehen, welche Philippi abgebildet hat. Vielleicht hatte Hancock eine Übergangsform zu dieser Skulptur vor Augen, als er schrieb (*Ann. Mag. Nat. Hist.,* **18**, 1846, p. 332), dass die Exemplare der David-Strasse stärker gerippt seien, als die aus Newfoundland. Die Farbe ist innen weiss, mit Seidenglanz, und äusserlich karminroth, wie ich noch bei keinem *P. islandicus* sahe, sondern übereinstimmend mit Hinds. Abbildung, nur etwas minder violett. (Middendorff.)

Type in Acad. St. Petersburg. Type locality, Bering Sea.

Range. Bering Sea.

Pecten islandicus pugetensis I. Oldroyd, 1919.

Plate 12, figs. 4, 5.

The Nautilus, **33**:136; pl. 4, figs. 5, 6.

Shell much smaller than the typical, sculpture coarser in proportion to the size. Shell more elongate and the ribs spinose. Ribs 17, with a very fine one in the interspaces. Length, 29; height, 31; diameter, 11; hinge line, 16 mm. (I. Oldroyd.)

Type in the Oldroyd Collection, Stanford University, No. 95. Type locality, off San Juan Island, Washington.

Range. Puget Sound.

Pecten jordani Arnold, 1903.

Plate 28, figs. 5, 6.

Memoirs California Acad. Sci., **3**:111; pl. 12, figs. 6, 7.

Shell shape of *P. islandicus,* averaging about 45 mm. in altitude, somewhat shorter than high, inequivalve, both valves convex, equilateral except for ears, rather thin, and with smooth margins. Right valve with about 25–30 angular smooth-topped, imbricated ribs, which become dichot-

omous after reaching a length of about 30 mm.; interspaces deeply channeled and narrower than ribs; anterior ear imperfectly radially ribbed with 6 ridges, and showing about 4 ribs; byssal notch not deep. Left valve with 25–30 narrow convex ribs, showing imbricating sculpture only slightly; interspaces as wide as or wider than ribs; after a diameter of 30 mm. has been reached by the left valve small intercalary ribs appear in most of the widening interspaces; anterior ear with 5 narrow imbricating ridges separated by wide interspaces. Both valves show a tendency to contract suddenly at the basal margin upon nearing completion of growth; surface of both valves covered with a minute lattice-like sculpture, which is generally worn off on exposed portions of the shell. Alt., 45; long., 42; hinge line, 18; diameter 15 mm. (Arnold.)

TYPE in U. S. N. M. and described from a fossil. Type locality, Pliocene, of San Pedro, California.

RANGE. Puget Sound. In the Pleistocene and Pliocene of Santa Barbara, San Pedro, and San Diego.

Pecten paucicostatus Carpenter, 1864.

Plate 41, figs. 4, 5.

Suppl. Rep. Brit. Assoc., p. 645. Arnold, *Tert. Pectens Cal.;* pl. 39, figs. 3, 4.

P. testa subconvexa, vix æquilaterali; castaneo seu rubido seu electrino picta; costis xi.–xv., validia, angustis, rotundatis; interstitiis multo latioribus, subplanatis; tota superficie minutissime concentrice striata; auriculis latis, haud æqualibus, lirulis circ. vi. ornatis; sinu paucidentato; intus pallidiore, linea cardinis costata, ad suturas auricularum tuberculossa; fossa ligamentali curta, transversim lata. Long., 1.7; lat., 1.84; alt., .56. (Carpenter.)

Shell averaging about 35 mm. in altitude, longer than high, subequivalve, moderately ventricose; thick shelled; margins smooth. Right valve subequilateral, slightly more ventricose than the left; ribs 12 to 14, prominent, convex-topped, subangular; interspaces slightly wider than the ribs, somewhat rounded incremental sculpture fine and regular, not looped; hinge line about five-sevenths length of disk; ears moderately prominent; anterior ear with about 5 prominent radiating ridges and numerous incremental lines; byssal notch prominent; posterior ear similar to anterior in sculpture, except that it is not quite so pronounced as in the latter. Left valve with prominent subangular ribs, slightly narrower than those of the right valve; interspaces correspondingly wider and flat-bottomed; ears similarly sculptured to those of right valve. (Arnold.)

TYPE in the Boyce Collection, Utica, New York. Type locality, Gulf of California.

RANGE. Santa Barbara, California, to the Gulf of California.

SECTION PATINOPECTEN Dall, 1898.

Pecten caurinus Gould, 1850.

Plate 6, fig. 1 and Plate 4, fig. 1.

Proc. Boston Soc. Nat. Hist., 3:345. Arnold, *Tert. Pectens Cal.;* pl. 38, 39.

Shell large, rather thick, nearly circular, a little inequilateral, and slightly oblique; the valves unequal; the upper valve is purplish-red, slightly convex marked with delicate lines of growth, and with 20 or more slightly raised, rounded ribs, about half as wide as the interspaces, diminishing toward the sides, and sometimes nearly subdivided by one or more furrows; the lower valve more convex, white, and becoming reddish toward margins, and with about 21 ribs, equal to the interspaces, elevated, flattened at summit, and with the sides vertical, and even incumbent; sometimes there are obsolete intervening ones. The ears are transverse, nearly equal, the anterior ones faintly rayed with scattered liræ; the sinus broadly rounded; beaks roseate, compressed; interior milk-white, with a silky lustre, and roseate marginal line. Length, 3¾; height, 2¼; diameter, 1 poll.* (Gould.)

TYPE in Boston Soc. Nat. Hist. Type locality, Port Townsend, Admiralty Inlet.

RANGE. Wrangell, Alaska, to Siletz Bay, Oregon.

SECTION LEPTOPECTEN Verrill, 1897.

Pecten latiauritus Conrad, 1837.

Plate 22, fig. 2.

Jour. Acad. Nat. Sci. Phila., 7:238; pl. 18, fig. 9.

Shell inequilateral, thin, compressed; ribs 14, flattened on the back, slightly sulcated; interspaces striated; ears very wide, unequal, both acutely angulated at the extremity; color reddish brown and white, variegated or spotted. Length, 30; height, 34; diameter, 6 mm. (Conrad.)

TYPE in Phila. Acad. Sci. Type locality, near San Diego, California.

RANGE. Monterey, California, to the Gulf of California.

Pecten latiauritus monotimeris Conrad, 1837.

Plate 40, figs. 1, 2.

Jour. Acad. Nat. Sci. Phila., 7:238; pl. 18, fig. 10.

Shell ovate, oblique, thin, compressed, with concentric striæ; ribs 13, rounded; ears subequal; color brown, with white stripes and spots. Length, 20; height, 19; diameter, 9 mm. (Conrad.)

TYPE in Phila. Acad. Sci. Type locality, San Diego, California.

RANGE. Monterey, California, to the Gulf of California.

* Poll. equals an inch.

Pecten latiauritus fucicolus Dall, 1898.

Trans. Wagner Free Inst., 3:710. *Zool. Sulphur Voy. Moll.;* pl. 17.

Shell moderately compressed, smooth, concentric sculpture obsolete; ribs low, rounded, wide, entire; hinge line shorter than in the type, and without any sinus between the posterior ears and the disk. Length, 30; height, 31 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Santa Barbara, California.

RANGE. Santa Barbara, California, to Cape San Lucas, Lower California.

SECTION PLAGIOTENIUM Dall, 1898.

Pecten circularis Sowerby, 1836.

Proc. Zool. Soc., p. 110. *Thes. Conch. Pecten;* pl. 15, figs. 105, 106.

Shell globose, very ventricose, equilateral, inequivalve, valves, right the more convex, rayed with 18 smooth strong ribs, of which the interstices are excavated; ash white, stained and variegated with grayish black; ears equal. (Conch. Iconica.)

Pect. testa suborbiculari, tumida, subæquivalvi, æquilaterali, fusco alboque varia, auriculis magnis, subæqualibus; costis radiantibus octodecim interstitiis latioribus, arcuatim striatis; valva altera sulcis profundioribus. Long., 1.5; lat., 0.8; alt., 1.4 poll. (Sowerby.)

This is the species that has been called *P. ventricosus* Sowerby, but that species comes from St. Elena, and young specimens were brought by Mr. Cuming from Calapan, Philippines. (Sowerby.)

TYPE in Museum Cuming. Type locality, ad Sinum Californiæ. (Guaymas.)

RANGE. Monterey, California, to Payta, Peru.

Pecten circularis æquisulcatus Carpenter, 1865.

Plate 42, figs. 1, 2.

Ann. Mag. Nat. Hist. (3) 15:179. Arnold, *Tert. Pectens Cal.;* text figs. 1, 2; pl. 50, fig. 1.

P. testa P. ventricoso simili, sed tenuiore, minus ventricosa; costis pluribus angustioribus xx.–xxi.; interstitus (præcipue valva superiore) fere æqualibus; auriculis magnis productis, acutis; sinu serrato; testa jun, interstitiis alte insculptis, laminis concentricis crebris, vix extantibus, interstitia, costas auriculasque transeuntibus. Long., 3.2; lat., 3.35; alt., 1.5.

This is intermediate between the tropical *P. ventricosus* and the Atlantic *P. irradians.* (Carpenter.)

P. var. æquisulcatus varies from the typical *P. circularis,* by its larger size when adult, flatter and thinner disk, narrower ribs, and more subdued coloration. (Arnold.)

TYPE in the Boyce collection. Type locality, Santa Barbara, California.

RANGE. Santa Barbara, California, to Cape San Lucas, Lower California.

Subgenus PSEUDAMUSIUM H. & A. Adams, 1858.

Shells small, thin, more or less translucent; the sculpture, if any, feeble; inner face of the disk without liræ; disk with or without Camptonectes striations, frequently with concentric imbrication. (Dall.)

TYPE. *Pecten exoticus* Chemn.

DISTRIBUTION. Alaska; South Atlantic.

Pecten randolphi Dall, 1897.

Plate 14, figs. 5, 6.

The Nautilus, **11**; No. **8**:86. *Proc. U. S. N. M.,* **24**; pl. 40, fig. 2.

Shell small, thin, glassy, unsculptured, except by minute (camptonectes) striation which covers both valves, and more or less obscure concentric undulations which are most distinct on the right valve near the umbo, and in some specimens altogether absent; hinge straight and short, anterior ears distinct, posterior ears not defined by any fold or sinus, outline suborbicular, valves compressed, especially the right one; right anterior ear with 6 small imbricated radii above, below a wide, transversely striated fasciole derived from a well-marked byssal sinus; ctenolium with 4 or 5 functional spines. Length 27.5; height, 26; diameter, 5 mm. (Dall.)

TYPE in U. S. N. M. Type locality, off Destruction Island, Washington, in 516 fathoms.

RANGE. Bering Sea to Guaymas, Mexico.

Pecten tillamookense Arnold, 1906.

U. S. Geol. Survey, Prof. Paper, No. **47**:139; pl. 48, figs. 3, 3a.

Shell resembling *P. randolphi* in outline and general characteristics. Disk ornamented by numerous more or less prominent, fine radiating ridges, microscopic radiating striæ, and incremental lines of varying prominence. The radiating ridges are narrow and thread-like, and appear to be more prominent anteriorly and near the lines of interrupted growth; the ribs are affected similarly to the disk by the interruptions in growth. The microscopic striæ cover the whole surface of the disk and ribs and in a general way radiate from the umbo, but seldom parallel to the ribs; on the portion of the disk and ear posterior to the umbo the striæ are perpendicular to the lines of growth and are thus nearly parallel and not radiating. The right anterior ear has from 6 to 12 prominently imbricated radials. Length, 30; height, 30; diameter, 7 mm. (Arnold.)

TYPE in U. S. N. M., No. 150233. Type locality, off Tillamook Bay, Oregon, Station 3346, in 786 fathoms.

RANGE. Pribiloff Islands, Bering Sea, to San Diego, California.

Pecten vancouverensis Whiteaves, 1893.

Plate 12, figs. 6, 7.

Ottawa Nat., 7:133; pl. 1, fig. 1.

Shell small, equivalved, compressed lenticularly, both valves being equally convex, ovately subcircular in outline apart from the ears and rather oblique; valves extremely thin and fragile, translucent and almost transparent, pale horn color with a slightly yellowish hue. Beaks placed a little behind the mid-length; hinge line straight and very long; ears unequal in size, the posterior pair, which are much smaller than the anterior, alike indistinctly defined, and merging gradually and imperceptibly into the general convexity and marginal contour of that side of each valve; anterior ears large, subtriangular, prolonged laterally, and longer than high, distinctly defined, that of the right valve with a deep and acutely angular byssal sinus at its base. Surface marked by densely crowded and exceedingly minute, irregular, and rarely continuous, but on the whole, radiating, simple or bifurcating raised lines, also by comparatively large, regularly disposed, and distant squamose radii. In the center of each valve the minute and nonsquamose raised lines are essentially parallel to the larger squamose radii, but on the sides the former are disposed obliquely to the latter. The surface of the anterior ear of each valve is minutely cancellated with extremely minute raised lines, which are almost parallel to the hinge line, in addition to the coarse cross lines. The whole sculpture of the exterior of the test is far too minute to be clearly seen without the aid of a miscroscope or powerful simple lens, but under either of these a few faint concentric lines of growth are also visible. Length, 7.75; height, 7.5; diameter, 2.25 mm. (Whiteaves.)

It was taken for the young of *P. caurinus*.

TYPE in Ottawa? Type locality, Forward Inlet, Quatsino Sound, Vancouver Island.

RANGE. Bering Sea to San Diego, California.

Pecten bistriatus Dall, 1916.

Proc. U. S. N. M., 52:404.

Shell small, suborbicular, moderately convex, white, thin, left valve finely concentrically, rather distantly lamellose, the lamellæ closer and more conspicuous on the subequal ears; radial sculpture of very fine, close-set, uniform almost microscopic elevated lines, which do not reticulate the lamellations; right valve with the concentric, but without the radial sculpture, convex near the margin, the disk about as convex as the

other valve, ears subequal, byssal notch short, acute; one or two faint radii on the ear above it. Height, 7; breadth, 7; diameter, 2 mm. (Dall.)

TYPE in U. S. N. M., No. 214056. Type locality, off San Diego, California, in 822 fathoms.

RANGE. Known only from the type locality.

Pecten davidsoni Dall, 1897.

The Nautilus, 11:86, *Proc. U. S. N. M.,* 24; pl. 40, figs. 5, 6.

Shell small, suborbicular, compressed, waxen white, the left valve with 21 rounded ribs, surmounted by (when not worn off) continuous rows of minute subglobular scales, the interspaces wider, flat and perfectly smooth, ears very small, the anterior with five or six imbricated radii; sculpture obsolete near the umbones; right valve sculptured with faint concentric impressed lines over the whole surface, and distally with numerous minute, obsolete, fine, scaly riblets; posterior ear transversely striated, very small, anterior one with four or five scaly radii, a well marked sinus leaving an imbricated fasciole and no ctenolium. Interior polished, the left valve fluted internally in harmony with the external ribs. Alt., 14; lat., 14; diameter, 3.5 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Davidson Bank, Alaska, in 280 fathoms green mud.

RANGE. Davidson and Bowers Banks, Bering Sea.

Pecten incongruus Dall, 1916.

Proc. U. S. N. M., 52:403.

Shell small, white, suborbicular, left valve rather flat with short straight hinge line, ears concentrically scaly, sculpture of disk concentric continuous low sharp lamellæ, crossed by slightly raised radial lines, conspicuous only at the intersections which form in the middle of the disk square reticulations with a small conspicuous pustule at each intersection; laterally these are more crowded; right valve concave near the margin, closely regularly concentrically lamellose; anterior ear with five radial lines, coarsely lamellose with a shallow notch and serrate margin. Height, 14; breadth, 15; diameter, 3 mm. (Dall.)

TYPE in U. S. N. M., No. 207273. Type locality, Station 2986, southwest of San Diego, in 684 fathoms.

RANGE. Known only from the type locality.

Pecten binominatus* Hanna, 1924.

Sci. Res. Can. Ar. Exp., 8. pt. A, 19a, pl. 2, figs. 7, 8. *Proc. Cal. Acad. Sci.* (4) 13:175.

Shell suborbicular, translucent white, extremely thin and fragile; hinge line straight, the ears subequal, the right anterior ear slightly con-

* New name for *Pecten andersoni* Dall, 1919; not *P. andersoni* Arnold, 1906.

vexly striated but with no perceptible byssal notch or ctenolium; the right valve with a few faint concentric undulations near the umbo; beyond that smooth, near the lower margin concave and appressed against the margin of the opposite valve; left valve more convex, equilateral, smooth, polished with a few faint irregular radial markings near the base. Interior polished, the ligament very small. Length of hinge line, 9.5; disk, 24; height, 22; max. diameter, 5 mm. (Dall.)

TYPE in Ottawa. Type locality, Dolphin and Union Strait, Northwest Territories.

RANGE. Dolphin and Union Strait, Arctic Ocean.

Subgenus PROPEAMUSIUM Gregorio, 1883.

Pecten alaskensis Dall, 1871.

Plate 12, fig. 3, and plate 38, fig. 6.

Amer. Journ. Conch., 7:155; pl. 16, fig. 4.

Shell nearly equilateral, inequivalve, flesh color, with a blush of salmon color on the umbo of the superior valve. Internally white, the salmon color showing through the valve. Shell suborbicular, barring the auricles, which are wide and prominent. Lower (or right) valve flattened, 0.1 inch (2.5 millimeters) smaller than the upper one; sculpture of fine, close, equal, concentric ridges, sharply defined and separated by narrow noncanaliculated grooves. Valves covered with a fine velvety epidermis, ashy and very finely radiately striate. Surface of the valve, except for the ridges, smooth. Anterior auricle long, prominent, with a deep sinus. Posterior auricle small; both with strong elevated lines of growth, which rise into scales on the 8 or 9 fine ribs with which the anterior auricle is furnished. Hinge line straight, smooth. Inside of the valve polished, furnished with 21 rounded, radiating ribs, with traces of others intercalated near the margin; nodulous or swollen at the more prominent ridges of growth and at the margin. Upper (or left) valve similar inside; anterior auricle shorter, not so deeply sinuated. Valve more convex than the under one, and a little longer. Dorsal areas finely granulate. Umbo smooth; half way toward the margin the striæ increase, become more conspicuous, and about 35 pseudoribs radiate toward the margin. These are formed by the elevation of the concentric lines of growth like ruffles, in such a way that the edge of one fluting of the ruffle overhangs the beginning of the next, and so on. These are very fragile, and when broken away show the nearly smooth surface of the valve underneath, without any true rib at all. Faint ribs are intercalated between the pseudoribs toward the margin. Height, 19.5; breadth, 19.5; diameter, 5 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Pribiloff Islands, Alaska.

RANGE. Pribiloff Islands, Bering Sea, to the Santa Barbara Islands, California. Also Japan.

Genus **HINNITES** Defrance, 1821.

Shell oval, irregular, inequivalve, subequilateral, close, adhering by the right valve; eared irregularly; hinge without teeth; ligament thick, in a deep, narrow pit. Differs from *Pecten* in its irregular growth, and in being adherent. (Tryon. S. S. Conch.)

TYPE. *Hinnites cortezi* Defrance.

DISTRIBUTION. Europe, California.

RANGE IN TIME. Trias of Greenland and Europe.

Hinnites giganteus Gray, 1825.

Plate 25, figs. 1a, 1b.

Ann. Phil., (2), **12**:103.

Shell ovate, convex, radiately scabrous-ridged, smooth and neatly disposed in pairs near the umbones; orange red, or whitish, interior white, stained with rich purple violet near the hinge. Length, 125; height, 106; diameter 40 mm. (Conch. Iconica.)

TYPE in British Museum? Type locality, California?

RANGE. Aleutian Islands to Magdalena Bay, Lower California. In the Pleistocene at Santa Barbara and San Diego; Pliocene, Santa Rosa Island, Ventura County, Los Angeles County, California.

Family LIMIDÆ.

Genus **LIMA** (Bruguière) Cuvier 1798.

Shell equivalve, compressed, obliquely oval; anterior side straight, gaping, posterior rounded, usually close; umbones apart, eared; valves white, smooth, punctate-striate, or radiately ribbed and imbricated; there is usually a thin, brownish epidermis; hinge area triangular, cartilage pit central; adductor impression lateral, large, double; pedal scars two, small. (Tryon. S. S. Conch.)

TYPE. *Ostrea lima* Linnæus.

DISTRIBUTION. Norway, Britain, West Indies, Canaries, India, Australia, United States.

RANGE IN TIME. Carboniferous and Pleistocene.

Subgenus MANTELLUM Bolten, 1798.

Lima dehiscens Conrad, 1837.

Journ. Acad. Nat. Sci. Phila., 7:247; pl. 19, fig. 7.

Shell elliptical, with radiating striæ; on one side profoundly gaping; margin of the hiatus thickened within, subreflected exteriorly; ears very

small, on the gaping side acutely pointed. Length, 24; height, 15; diameter, 11 mm. (Conrad.)

TYPE in Phila. Acad. Sci.? Type locality, Fayal Island.

RANGE. Monterey, California, to Acapulco, Mexico.

Subgenus LIMATULA S. Wood, 1839.

Lima attenuata Dall, 1916.

Proc. U. S. N. M., **52**:404.

Shell small, narrow, thin, white, radiately sculptured with low, rather close-set, rounded threads, crossed near the distal margin with low concentric irregular lamellations so as to give that part of the valve a minutely scabrous effect; the medial radii are broader than the others and radially striate, no mesial sulcus is noticeable but it is clearly indicated on the inside of the valve; beaks low, incurved; area triangular, resilifer large and excavated; hinge margin short, strongly buttressed on each side; valve margin crenulate. Height, 7; width, 3.6; diameter, 4 mm. (Dall.)

TYPE in U. S. N. M., No. 220510. Type locality, Nazan Bay, Atka Island, Aleutian chain.

RANGE. Southern Bering Sea, the Aleutian Islands, and eastward to Shumagin Islands, Alaska.

Lima subauriculata Montagu, 1808.

Plate 5, fig. 10.

Test. British Suppl., p. 63. Jeffreys, *Brit. Conch.*, 5; pl. 25, fig. 3.

Shell ovate-oblong, pellucid, white, equilateral, equivalve, furnished with small, equal, angular projections, or sub-auricles, and wrought with numerous longitudinal striæ that slightly crenate the margin; along the middle are two striæ that appear more conspicuous than the rest by being opaque, and are equally evident on the inside, a character constant in several specimens examined. Length, one-fourth of an inch; breadth, half its length. (Montagu.)

TYPE in British Museum. Type locality, Great Britain.

RANGE. British Columbia to San Quentin Bay, Lower California. Also Atlantic.

Family ANOMIIDÆ.

Genus **ANOMIA** Linnæus, 1758.

Shell suborbicular, very variable, translucent, and slightly pearly within; attached by a plug passing through a hole or notch in the right valve; upper valve convex, smooth, lamellar or striated; interior with a sub-marginal cartilage pit, and four muscular impressions, three subcentral, and one in front of the cartilage; lower valve concave, with a

deep, rounded notch in front of the cartilage process; disk with a single (adductor) impression. (Linnæus.)

TYPE. *Anomia ephippium* Linnæus.

DISTRIBUTION. North America, Britain, Black Sea, India, Australia, W. Am. Icy Sea.

RANGE IN TIME. Oölite.

Anomia peruviana Orbigny, 1846.

Proc. Zool. Soc., 1846, p. 117. This is the shell that has been called *A. lampe* Gray, 1849, *Voy. Amer. Mer.*, p. 673. Philippi. *Abb. u. Beschr.*, 3; pl. 1, fig. 2.

Shell yellowish green, radiately costated; internal green. Upper muscular scar large, squarish; lower two rather smaller, subequal, near together and to the upper scar, and nearly on the same line; sinus in lower valve very large. Length, 36; height, 40; diameter, 6 mm. (Orbigny.)

TYPE in Museum Cuming. Type locality, California.

RANGE. San Pedro, California, to Peru, and Galápagos Islands. In the Pleistocene at Ventura, San Pedro and San Diego, California.

Genus **PODODESMUS** Philippi, 1837.

Valves radiately grooved; perforation of lower valve moderate, firmly embracing and enclosing the plug. (Tryon. S. S. Conch.)

TYPE. *Pododesmus decipiens* Phil.

DISTRIBUTION. West Indies, Britain, New Zealand, California, Bering Sea, Ochotsk.

Pododesmus macroschisma Deshayes, 1839.

Plate 26, figs. 1a, 1b.

Revue Zool. Soc. Cuvierienne, p. 359. Guérin, *Mag. de Zool.*, 1841; pl. 34.

Shell ovate, rather solid, radiately rudely plicately ribbed, ribs very irregular, here and there swollen and bifurcated; yellowish white; perforation very large. This fine species is distinguished by a broadly ribbed growth, the ribs being very irregular. (Conch. Iconica.)

TYPE in Cuming Museum. Type locality, Kamchatka.

RANGE. Southern Bering Sea, from the Pribiloff Islands, and Unalaska, to San Diego. Also Japan. In the upper Miocene of Sooke, Vancouver Island, Pliocene of San Diego; Pleistocene of California, Oregon, and Alaska.

Family MYTILIDÆ.

Genus **MYTILUS** Linnæus, 1758.

Shell wedge-shaped, rounded behind, smooth in the typical species; umbones terminal, pointed; hinge teeth minute or obsolete; pedal muscular

impressions two in each valve, small, simple, close to the adductor. (Tryon. S. S. Conch.)

TYPE. *Mytilus edulis* Linnæus.

DISTRIBUTION. World-wide. Ochotsk, Bering Sea, Russian Ice-meer; Black Sea, Cape Horn, New Zealand.

RANGE IN TIME. Silurian of United States, Europe, South India.

Mytilus californianus Conrad, 1837.

Plate 27, fig. 2.

Jour. Acad. Nat. Sci. Phila., 7:242; pl. 18, fig. 15.

Shell ovate elongated, inflated; anterior margin straight; posterior side emarginate; ribs not very numerous, slightly prominent, broad, rounded; lines of growth very prominent. Length, 2⅛ inches. (Conrad.)

TYPE in U. S. N. M. or Phila. Acad. Nat. Sci. or State Museum at Albany, New York. Type locality, San Diego, California.

RANGE. Unalaska, Aleutian Islands, to Socorro Islands. In the Pleistocene, California, and Pliocene, San Fernando, California.

Mytilus edulis Linnæus, 1758.

Plate 27, fig. 4.

Syst. Nat. ed. 10, p. 705. Gould, *Invert. Mass.;* fig. 82.

M. testa læviuscula violacea, valvulis obliquis postice acuminatis. (Linnæus.)

Shell obliquely triangular, concentrically striated, blue-black, olive, rayed with black, rather compressed posteriorly, anteriorly arcuately impressed. (Conch. Iconica.)

TYPE in British Museum? Type locality, North Atlantic.

RANGE. Arctic Ocean to San Diego and world-wide in temperate waters. In the Pliocene, Benicia, Solano County, and San Diego, California.

SECTION HORMOMYA Mörch, 1856.

Mytilus adamsianus Dunker, 1856.

Plate 29, fig. 4.

Proc. Zool. Soc., 1856, p. 360; *Conch. Iconica,* Mytilus, pl. 11, fig. 55.

M. testa ovato-trigona, utrinque obtuse carinata, solidula, costis mature bifidis eleganter granosis sculpta, fusco-purpurascente et albida; epidermide cornea vestita; umbonibus terminalibus; margine crenato. 10 lin. longa, 5½ lin. alta, 4½ lin. lata. (Dunker.)

Shell ovately triangular, very gibbous, posteriorly flatly compressed, attenuately beaked at the umbones, fan-shaped anteriorly, everywhere neatly flexuously ribbed, ribs granularly serrated, dichotomous toward the margin; olive, tinged with black. (Conch. Iconica.)

TYPE in Museum Cuming. Type locality, Panama.

RANGE. Santa Barbara, California, to Panama and Galápagos Islands.

Genus **SEPTIFER** Recluz, 1848.

Shell equivalve, very inequilateral; ventral margins sub-concave and cut out for the passage of the byssus; beaks sub-terminal, curved; hinge without teeth, furnished with a lamellar septum; ligamental pits linear, marginal, dorsal, anterior, with a white, nearly spongy margin within; muscular impressions superficial, the anterior small, rounded, the posterior large, subdorsal, uniform.

TYPE not known to the writer.

DISTRIBUTION. Warm seas.

RANGE IN TIME. In the Silurian, Carboniferous and Permian of Europe. In the Pleistocene at Santa Barbara, San Pedro, and San Diego, California.

Septifer bifurcatus (Conrad) Reeve, 1837.

Jour. Acad. Nat. Sci. Phila., 7:241; pl. 18, fig. 14.

Shell narrowed, slightly arcuate; anterior margin much flattened; ribs narrow, prominent, bifurcated toward the base; color dark purple. Height 1½ inches. (Conrad.)

TYPE in Phila. Acad. Nat. Sci.? Type locality, Oahu, Hawaiian Islands.

RANGE. Crescent City, California, to the Gulf of California.

Septifer bifurcatus obsoletus Dall, 1916.

Proc. U. S. N. M., **52**:404.

Shell large, the external sculpture obsolete, the distal part of the valves nearly smooth. (Dall.)

TYPE in U. S. N. M., No. 173359. Type locality, San Diego Bay, mud flats.

RANGE. Known only from the type locality.

Genus **MODIOLUS** Lamarck, 1799.

Shell oblong equivalve, more or less ventricose, with the umbones small, rather swollen, not terminal, anterior side often expanded, posterior arched, contracted. Hinge linear, with the ligament marginal and partially internal. Muscular impression compound, sub-lateral.

The typical distinction between *Mytilus* and *Modiolus* consists in the latter having a lighter and more cylindrical, oblong shell, with the umbones rounder and not terminal, in consequence of the posterior extremity of the shell projecting beyond them. (Reeve.)

TYPE. *Modiolus modiolus* (Linnæus.)

DISTRIBUTION. Universal. Arctic seas, Britain. Fossil. Silurian? Lias—United States, Europe, Thibet, South India.

Modiolus modiolus Linnæus, 1758.

Syst. Nat. ed. 10, p. 706; *Conch. Iconica, Modiola,* pl. 1, fig. 2.

M. testa lævi margine dorsali dilatato, natibus gibbis, cardine sublaterali. (Linnæus.)

Shell oblong, somewhat trapeziform, ventricose toward the umbones, smooth or obsoletely wrinkle-striated; dark chestnut. (Conch. Iconica.)

TYPE in British Museum? Type locality, Mediterranean.

RANGE. Arctic to San Pedro, California, and Circumboreal.

Modiolus rectus Conrad, 1837.

Jour. Acad. Nat. Sci. Phila., 7:243; pl. 19, fig. 1.

Shell produced, smooth, thin; anterior margin elevated; posterior side cuneiform; color brown, with a broad pale stripe extending from the beak toward the posterior margin; within very glossy and iridescent. Length, 2 inches. (Conrad.)

TYPE in Phila. Acad. Nat. Sci.? Type locality, near Santa Barbara, California.

RANGE. Bolinas Bay, California, to Magdalena Bay, Lower California. In the Pliocene, Santa Rosa; Twelve Mile House, San Mateo County; Soquel, Santa Cruz County; San Fernando; San Diego Well; San Diego. Miocene, El Toro Ranch, Monterey County; Foxen's, Santa Barbara County.

Modiolus flabellatus Gould, 1850.

Plate 6, fig. 2.

Boston Jour. Nat. Hist., 3:346. *Rep. U. S. Expl. Exp. Moll.;* fig. 11.

Shell large, elongated, trapezoidal, dilated posteriorly; beaks elevated, pyramidal, contiguous, acute, placed at the anterior seventh; umbonal ridge elevated, angular above, widening and becoming more rounded backward; portion anterior to the slope trigonal, wedge-shaped in three directions; extremity narrow, rounding upward; dorsal and ventral margins diverging, rectilinear for three-fourths of length, when the upper margin rounds downward; posterior extremity broadly rounded; epidermis glossy, first triangular third of a scorched, dark-chestnut brown or tan colour, palest at extremity; posterior third pale yellowish-corn colour; behind the umbonal ridge rigid with a coating of loose fringe-like terminations of the layers of growth; interior pearly white; slightly gaping in front. Length, 50; height, 100; diameter, 35 mm. (Gould.)

TYPE in Boston Nat. Hist. Soc.? Type locality, Puget Sound.

RANGE. Vancouver Island to San Diego, California.

Modiolus capax Conrad, 1837.

Jour. Acad. Nat. Sci. Phila., **7**:242. *Conch. Iconica*, **10**:3; fig. 11.

Shell much inflated; anterior margin slightly retuse in the middle; umbo broad; summit obtusely rounded; posterior margin salient in the middle; epidermis chestnut brown, fibrous at base; within bluish, tinged with yellow. Length, 3 inches. (Conrad.)

TYPE in Phila. Acad. Nat. Sci.? Type locality, San Diego, California.

RANGE. Santa Barbara, California, to Payta, Peru.

Modiolus fornicatus Carpenter, 1864.

Suppl. Rept. Brit. Assoc., p. 643. *Ann. Mag. Nat. Hist.*, (3) **15**:178.

M. testa curta, lævi, latiore, maxime fornicata; pallide carnea, epidermide rufo-fusca, rugis incrementi et incrustatione densissime pilosa induta; umbonibus maximis, spiralibus, antice torsis, per tres quadrantes totæ latitudinis devectis; area ligamentali curtissima, arcuata; margine dorsali antice nullo, postice longo, arcuato; margine ventrali recto, vix propter byssum hiante; postico lato, antico angusto; altitudine dorsaliter valde elevata, ventraliter plane declivi, cuneiformi; umbonibus trans marginem anticum per sextantem totius longitudinis excurrentibus: intus, sub umbonibus excavata; cicatr. adduct. ant. ventraliter sita. (Carpenter.)

Shell of medium size, short, oblong, inflated in front, swollen, equivalve; beaks anterior, not quite terminal, obtuse, marginal, bent forward; surface sculptured only with concentric, incremental lines; margins smooth; no hinge teeth. Length, 31; height, beaks to ventral margin, 54; diameter, 30. (Arnold.)

TYPE in Mrs. Boyce Collection, Utica, New York. Type locality, Santa Barbara, California.

RANGE. Monterey to San Pedro, California, and Cortez Bank, Lower California. In the Pleistocene at San Pedro, Ventura and Santa Barbara, California.

Modiolus politus (Verrill, 1880, var.?) **pallidulus** Dall, 1916.

Proc. U. S. N. M., **52**:405.

Shell thin, smooth, brilliantly polished, attenuated anteriorly, wide and bluntly rounded behind, divided into two color areas, the dorsal large, translucent with a whitish, zigzag reticulation, the ventral opaque white with a yellowish tinge; hinge edentulous, margins entire. Length, 23; maximum height, 11.5; beaks behind the anterior end, 1; diameter, 5 mm. (Dall.)

TYPE in U. S. N. M., No. 212746. Type locality, off San Luis Obispo Bay, California.

RANGE. Off Bodega Head, California, to Cerros Island, Lower California.

Subgenus GREGARIELLA Monterosata, 1883.

Modiolus opifex Say, 1825.

Jour. Acad. Nat. Sci. Phila., **4**:369; pl. 19, fig. 2.

Oval, reddish brown; anterior hinge-margin flattened, cordate; within iridescent. Base contracted behind the middle, the contraction not wide nor very deep; between this part and the beaks the surface is blackish and transversely wrinkled; posterior and anterior surface of the valve longitudinally striated, with the exception of the anterior cordate hinge-margin, which is flattened and covered by a thick stratum of compact sand; anterior tip equally arcuated above and below; within iridiscent, brilliant, striated as on the exterior surface, edge crenate. Breadth nearly half an inch; length more than one-fifth of an inch. (Say.)

TYPE in Phila. Acad. Nat. Sci. Type locality not known to the writer.

RANGE. Santa Barbara, California, to the Gulf of California.

Subgenus BRACHYDONTES Swainson, 1840.

Modiolus demissus Dillwyn, 1817.

Plate 27, fig. 1.

Descr. Cat. Rec. Shells, **1**:314. *Jour. Acad. Nat. Sci. Phila.*, **7**; pl. 20, fig. 7.

Shell about three inches long, and an inch-and-a-quarter broad; of a silvery white color, covered with a dark brown epidermis; the valves are covered with strong longitudinal striæ, except a small space on the anterior side below the hinge which is nearly smooth; the margin crenated and the inside white, indistinctly rayed with purple. (Dillwyn.)

This is the manuscript description of Solender, published by Dillwyn.

This species has been known under the name of *M. plicatula* Lamarck, 1819.

TYPE. The writer does not know where the type is. Type locality, Coasts of Carolina.

RANGE. San Francisco Bay. Imported with "seed" oysters from the Atlantic.

Genus **BOTULA** Mörch, 1853.

Surface deeply, concentrically sulcate, shell inflated, with conspicuously spiral umbos, the epidermis polished. (Dall.)

TYPE. *Mytilus cinnamomeus* Lamarck.

DISTRIBUTION. West Indies, New Zealand, California, Pacific Coast.

RANGE IN TIME. In the Carboniferous of Europe and the United States.

Subgenus ADULA H. & A. Adams, 1857.

Botula diegensis Dall, 1911.

Plate 11, figs. 1, 2.

The Nautilus, **24**:10, 110; *U. S. N. M. Bull.* **112**; pl. 1, figs. 1, 3.

Shell small, zoned with dark blue, the umbones usually white, covered with an olivaceous brown periostracum; anterior end very short, rounded, with two or three radial grooves externally; umbones moderately prominent; dorsal profile ascending, nearly straight, sub-angulate behind, the margin carried with a broad sweep to the base where it meets the posterior end of an obscure ridge, radiating from the umbos, in front of which the valves are more or less constricted and, on the base, flattened, giving a slightly arcuate aspect to the shell; valves with a very slight rather anterior gape; interior polished, dark blue, much as in *Mytilus edulis,* the ligament long, the anterior margin with three or four crenulations corresponding to the external radial grooves. Length, 19; height, 6.8; diameter, 5.5 mm. (Dall.)

TYPE in U. S. N. M. Type locality, San Diego, California.

RANGE. San Francisco Bay to Cape San Lucas, Lower California.

Botula falcata Gould, 1851.

Plate 21, figs. 8, 9.

Proc. Boston Soc. Nat. Hist., **4**:92. *Mexico and California* Shells; pl. 6, fig. 5.

Shell fragile, falcate, sub-cylindrical, with a strongly marked angle from the beaks to the base of the posterior extremity; beaks at the anterior eighth of the length, strongly involute and leaving a deep depression in front of them. The anterior extremity is rounded, dilated, broader than high; the posterior end is arcuate and acuminate; against the beaks the valves are somewhat compressed; the arcuation is produced chiefly by the deflection of the superior margin, which is also rather sharp posteriorly. The substance of the shell is somewhat pearly when exposed by erosion, and is covered by a thick chestnut-colored epidermis, conspicuously corrugated at every part, in vertical wrinkles posteriorly, but in a somewhat divaricated manner anteriorly. The posterior superior portion gives rise to a byssoid fringe. Length, 3; height, ½; diameter, ½ inch. (Gould.)

TYPE in Boston Soc. Nat. Hist.? Type locality, Monterey, California.

RANGE. Coos Bay, Oregon, to San Diego, California.

Botula californiensis Philippi, 1847.

Plate 27, fig. 5.

Zeitschr. Mal., p. 113. *Conch. Cab. ed. 2*; pl. 5, fig. 19.

Shell cylindrical, lithophagus-like, smooth, very thin, somewhat pointed, sub-nacreous, white, posterior end sometimes tinged with blue; epidermis

shining, smooth, thick, dark brown; young shells typically modiolaræform, umbos directed anteriorly; anterior dorsal margin slightly crenulated; adult shell with dorsal and ventral margins nearly parallel; anterior and posterior margins rounded; umbos worn, not conspicuous, situated about ⅙ the distance from the anterior to the posterior extremity; incrustation thin, porous, covering the posterior area diagonally, prolonged beyond the valves; internal ligament prolonged posteriorly; inner surface pale; posterior adductor scar large, circular, impressed; with a sub-umbonial callosity, conspicuous toward the pedal scar. Length, 40; height, 10; diameter, 11 mm. (Philippi.)

TYPE. Location of the type not known to the writer. Type locality, Vancouver Island.

RANGE. Vancouver Island to San Diego, California. Also North Japan.

Genus **DACRYDIUM** Torell, 1857.

Hinge crenulations tuberculiform anteriorly, elongate posteriorly. (Tryon. S. S. Conch.)

TYPE. *D. vitrea* Sars.

Dacrydium pacificum Dall, 1916.

Proc. U. S. N. M., **52**:405.

Shell minute, whitish, much the shape of *Modiolaria vernicosa* Midd. on a minute scale, differing from the Atlantic *D. vitreum* by its smaller size and more elongate outline. Length, 3.6; height, 2.5; diameter, 1.5 mm. (Dall.)

TYPE in U. S. N. M., No. 214092. Type locality, Station 3604, Bering Sea, in 1401 fathoms.

RANGE. Known only from the type locality.

Genus **LITHOPHAGA** Bolten, 1798.

Shell cylindrical, inflated in front, wedge-shaped behind; epidermis thick and dark; interior nacreous.

The "date shell" bores into corals, shells, and the hardest limestone rocks. (Tryon. S. S. Conch.)

TYPE. *Mytilus lithophagus* Linnæus (in part.)

DISTRIBUTION. West Indies, New Zealand, United States, Japan.

RANGE IN TIME. In the Carboniferous of Europe and the United States.

SECTION DIBERUS Dall, 1898.

Lithophaga plumula Hanley, 1844.

Proc. Zool. Soc., p. 17. *Descr. Cat.;* pl. 24, fig. 28.

Lit. testa L. canalifero simillima, sed extremitate antice minus obtusa; tegmine calcareo antico, crassiore, atque in parietibus confertis, subparallelis ordinato; parietibus corrugatis et (plumulæ haud dissimilibus) versus marginem et marginem anticum utroque latere radiantibus. (Hanley.)

Shell elongately cylindrical, posteriorly rounded, smooth, anteriorly attenuated, peculiarly roughly feathered. (Conch. Iconica.)

TYPE in Museum Cuming. Type locality, Panama.

RANGE. Monterey, California, to Patagonia. Also Atlantic.

SECTION LABIS Dall, 1916.

Lithophaga attenuata Deshayes, 1836.

Plate 39, fig. 10.

Anim. sans Vert., ed. 2, 7:28. Philippi, *Abb. u. Beschr.;* pl. 1, fig. 6.

Shell cylindrical, thin, posteriorly globose, then contracted and anteriorly gradually attenuated, smooth or obsoletely malleated throughout; yellowish olive. (Conch. Iconica.)

TYPE. The location of the type is not known to the present writer. Type locality, Chile or Peru.

RANGE. Monterey to San Diego, California; Patagonia.

SECTION MYOFORCEPS Fischer, 1886.

Lithophaga aristata Dillwyn, 1817.

Plate 39, fig. 2.

Descr. Cat. Rec. Shells, 1:303. Wood, *Index Test.;* pl. 12, fig. 8, 1825.

Shell sub-cylindrical, rounded at the hinge, and armed at the opposite extremity with two beak-like processes which cross each other. (Dillwyn.)

Shell an inch long, and rather more than one-third as broad; generally of a dirty white, but sometimes brownish or fawn-coloured; the want of striæ, and a beak-like process from the extremity of each valve, crossing each other like the mandibles of the *Loxia curvirostra,* distinguish this species from *M. lithophagus,* of which, however, Doctor Maton considers it to be only a variety. (Adanson.)

TYPE. Neither the location of the type nor the type locality is known to the present writer.

RANGE. La Jolla, California, to Peru. Also Atlantic.

Genus **MODIOLARIA** Beck (Jeffreys, 1863).

Shell rhomboidal, sculptured by two rows (one on each side) of striæ which radiate from the beaks, leaving the middle portion smooth; beaks incurved; hinge mostly toothless, but sometimes crenulated; hinge plate finely notched. (Tryon. S. S. Conch.)

TYPE. *Mytilus discors* Linnæus.

DISTRIBUTION. Temperate and Arctic seas.

Modiolaria nigra Gray, 1824.

Plate 13, fig. 21, and plate 39, fig. 9.

App. Parry's Voy., p. 244. *Voy. de la Recherche;* pl. 17, fig. 1.

Shell oval, inclining to oblong, compressed, rather thin, moderately glossy and slightly iridescent; sculpture, about a dozen remote ribs on the anterior side, and 50 to 60 close-set and thread-like ribs on the other side, which latter become finer toward the middle of the shell; ventral area not depressed, but without ribs; transverse striæ numerous, coarse and flexuous, sometimes forming tubercles or a rough network where they intersect the longitudinal ribs; colour purplish brown; epidermis rather thick, fawn colour in the young, olive green at a subsequent stage of growth, and dark brown or even pitch black in aged examples; margins rounded on all sides except the ventral, which is nearly straight; beaks small, prominent, incurved, and diverging, placed at some distance from the anterior margin; byssal sinus, ligament and hinge line as in the other species; hinge plate strengthened by a rib to receive the ligament, and finely notched; ligamental groove narrow and deep; hinge crenulated; inside highly nacreous, purplish brown, finely notched on the anterior and posterior edges, and showing the impressions of the ribs as well as faint traces of similar but finer striæ on the middle area; scars distinct. Length, 1.5; height, 0.65 inches. (Jeffreys, British Conchology.)

TYPE in British Museum. Type locality, Orsund Bay, Sweden.

RANGE. Arctic Ocean to Oregon. Circumboreal.

Modiolaria nigra obesa Dall, 1916.

Proc. U. S. N. M., **52**:405.

Shell resembling the typical flattish form but markedly more inflated. Length, 60; height, 31; diameter, 18 mm. (Dall.)

TYPE in U. S. N. M., No. 223317. Type locality, Plover Bay, near Bering Strait, in 8 to 20 fathoms.

RANGE. Arctic Ocean to Cape Flattery.

Modiolaria protracta Dall, 1916.

Plate 3, fig. 2.

Proc. U. S. N. M., **52**:405.

Shell resembling the young of typical form but more inflated and elongated, the sculpture very distinct, the medial area smooth, blackish, the dorsal areas olivaceous. Length, 13; height, 6.5; diameter, 5.5 mm. (Dall.)

TYPE in U. S. N. M., No. 222017. Type locality, north of Nunivak Island, Bering Sea, in 9 fathoms gravel.

RANGE. Nunivak Island, Bering Sea, to Monterey, California.

Modiolaria olivacea Dall, 1916.

Proc. U. S. N. M., **52**:405.

Shell small, thin, polished, pale olivaceous near the beaks, growing darker distally; medial area smooth, anterior area with six or seven rather strong radial grooves; posterior area with numerous, shallow-channeled radii crossed by rather regular, slightly elevated concentric lines, giving a silky luster to the surface; beaks inconspicuous, inflated; dorsum arched, base nearly straight, both ends evenly rounded, the posterior slightly wider; interior whitish, the margin crenulated by the sculpture, the beaks very close to the posterior end. Length, 10; height, 6; diameter, 6 mm. (Dall.)

TYPE in U. S. N. M., No. 210790. Type locality, off Bering Island, in 10 fathoms.

RANGE. Bering Sea to Catalina Island, California.

Modiolaria impressa Dall, 1907.

Plate 11, figs. 4, 5.

Smithsonian Misc. Coll., **50**:172. *U. S. N. M. Bull.*, **112**; pl. 3, figs. 6, 7.

Shell small, thin, arcuate, elongate, olive-green or brownish, with a small striate anterior area, deeply impressed middle area and large, tumid, nearly smooth posterior area; surface polished, beaks very anterior, inconspicuous; anterior area very short, with about six pairs of strong radial riblets; middle area polished, smooth, gaping below for the byssus, where the margin is a little convex, behind which it is conspicuously excavated; posterior area swollen, arcuate above, produced behind and below, dropping vertically to meet the depressed middle area, faintly concentrically and obsoletely minutely radiately striated; interior pearly; inner margins crenulate around the distal areas, medially smooth, with a few interlocking denticulations just behind the internal ligament, but none in front of the beaks; byssus strong. Length, 10; height, 19; diameter, 9 mm. (Dall.)

TYPE in U. S. N. M., No. 110467. Type locality, U. S. S. Albatross Station 4677, Bering Sea, in 52 fathoms.

RANGE. Petrel Bank, Bering Sea.

Modiolaria taylori Dall, 1897.

Plate 28, figs. 9, 10.

Bull. Nat. Hist. Soc. British Columbia, **2**:5; pl. 1, figs. 17, 18.

Shell small, rather solid, modioliform, with a greenish epidermis, and dark purple nacre shining through; inflated, with the middle area of the exterior of the valves impressed; beaks low, not quite terminal; surface smooth, except for lines of growth; the anterior area very small, with some obscure radial striæ; the middle area smooth, its basal margin pouting a little; posterior area, covering more than half the shell, swollen; ligament obscure, almost internal; margins of the valves smooth, except for some small denticulations on a thickened area below the beaks, and a few beyond the distal end of the ligament. Length, 5.5; height, 5; diameter, 2.5 mm. (Dall.)

TYPE in U. S. N. M.? Type locality, Victoria, Vancouver Island, British Columbia.

RANGE. Known only from the type locality.

Modiolaria substriata Gray, 1824.

App. Parry's Voy., p. 245. *Voy. de la Recherche;* pl. 17, fig. 3.

Shell somewhat oval, rather oblique, highest about the middle, rounded before, base slightly curved, hinge margin straight and then curving obliquely downward; beaks near the anterior end, prominent, and rounded; valves moderately convex; surface coarsely marked by lines of growth, and divided into three fan-shaped compartments, of which the foremost one is marked by about 8 small, rounded, rib-like ridges, the spaces between them being flat, the hinder one marked by numerous similar ridges, the central one being plain or with very minute radiating lines; the limits between the posterior and middle compartments are designated by an elevated ridge passing from the beaks, and here the basal margin of the posterior compartments projects abruptly beyond that of the middle one, so that the rounded point of the shell forms a projecting lobe. Epidermis olive green, with dark chestnut-colored shades, folding over the edge. Interior of a brilliant, silvery lustre; edge of the two extreme compartments crenulated, and very strongly so near the ligament; a few folds on the edge not corresponding to the external ridges, are found just in front of the ligament. Length, 1 inch; height, $^{13}/_{20}$ of an inch; breadth, $^{7}/_{10}$ of an inch. (Gould, Invert. of Mass.)

The above is the description of *Modiolaria discors* Linnæus which, with *Modiolaria lævigata* Gray, is the same as *M. substriata.* I did not have access to the latter. The type locality of *M. lævigata* is Greenland.

TYPE. Neither the location of the type or the type locality is known to the present writer.

RANGE. Arctic Ocean to Puget Sound.

Modiolaria corrugata Stimpson, 1851.

Plate 14, figs. 8, 9.

Shells of New England, p. 12. Gould, *Invert. Mass.;* fig. 84.

Shell irregularly oval, tumid, heart-shaped when viewed in front, bluntly rounded before; hinge margin somewhat ascending and a little compressed; at the termination of the ligament the margin gradually curves downward so that the shell is terminated behind by a lobular, somewhat pointed, tip on a level with the base; basal margin an undulating curve nearly parallel with the upper margin; beaks large and prominent, not in contact, overhanging the anterior extremity; surface as in *M. discors;* but there are sixteen or more ribs in the anterior compartment; those in the posterior compartment are more crowded, more distinct, the intervening spaces rounded; and, when viewed under the microscope, the whole surface is found to be covered with wrinkles of the epidermis crossing the ribs and the spaces between them and also the middle compartment; epidermis greenish yellow with clouds of olive. Within silvery, margin crenulated by the ribs, and with three or four teeth before the beaks. Length, 37; breadth, 20 mm. (Gould, Invert. Mass.)

TYPE in Cuming Collection, British Museum. Type locality, Massachusetts.

RANGE. Arctic Ocean to Puget Sound. Circumboreal.

Modiolaria marmorata Forbes, 1838.

Malac. Monensis, p. 44. Forbes and Hanley, *Brit. Moll.;* pl. 45, fig. 4.

Tumid, oblique, usually marbled with colored markings, smooth in the middle, rayed with impressed lines at both extremities; beaks quite terminal. Length, ¾ of an inch; breadth, about five lines. (Forbes and Hanley.)

TYPE. Neither the location of the type nor the type locality is known to the present writer.

RANGE. Puget Sound. Circumboreal.

Modiolaria seminuda Dall, 1897.

Plate 28, fig. 1.

Bull. Nat. Hist. Soc. Brit. Col., **2**:5; pl. 1, fig. 1.

Shell short, thin, inflated, with a polished greenish epidermis; beaks turgid but not prominent; surface divided by the sculpture into three areas; the anterior small, with coarser, radiating riblets; the middle, smooth and larger; the posterior, covering about two-thirds of the shell, finely radiately striate; the only concentric sculpture is that of the delicate lines of growth. Interior of the valves with a pale whitish nacre, the sculpture showing through and denticulating the margin; thickening below the beaks inconspicuous, finely denticulate; ligament thin, short, not prominent. Extreme length of shell, 12; height, 9; diameter, 7.5 mm. (Dall.)

TYPE in U. S. N. M.? Type locality, Markoffski Bay, Unalaska.

RANGE. Bering Sea to Forrester Island, Alaska.

Modiolaria vernicosa Middendorff, 1849.

Plate 28, fig. 11.

Mal. Rossica, **3**:20; pl. 11, figs. 25–27.

This species may be recognized by its smooth surface and reddish brown, brilliantly polished epidermis.

TYPE. Neither the location of the type nor the type locality is known to the writer.

RANGE. Bering Sea to Sitka, Alaska.

Modiolaria phenax Dall, 1916.

The Nautilus, **28**:12:138.

Shell small, very solid, inflated, brownish or bluish black, mytiliform; anterior end very short, but with the beaks extending slightly in front, attenuated, rounded, compressed below, with two or three radial, impressed sulci; posterior end widening, rounded, the dorsal margin with an obscure angle about midway, the base behind the sulci convexly arcuate; the beaks blunt, inflated, conspicuous; surface polished, with inconspicuous incremental irregularities; interior blackish purple, with a very strong nymph for the ligament, and three or four denticles where the external sulci méet the margin. Length, 7.7; height, 4.5; diameter, 4 mm. (Dall.)

TYPE in U. S. N. M., No. 271733. Type locality, St. George Island, Pribiloff group, Bering Sea.

RANGE. Known only from the type locality.

Genus **CRENELLA** Brown, 1827.

Shell oblong-oval, equilateral, ventricose; beaks obtuse, slightly turned to one side; hinge destitute of teeth, but with a flattened, horizontal, slightly crenated plate on one side of the hinge in each valve; right valve with a triangular, horizontal, projecting, reflexed plate, and the left one with an oblique plait, both of which are a little crenated externally. (Brown.)

TYPE. *Mytilus decussata* Montagu.

DISTRIBUTION. Low-water mark to 150 fathoms; Norway, Iceland, Greenland, New England, Britain, France, Pacific Coast.

RANGE IN TIME. In the Eocene and Pleistocene.

Crenella decussata Montagu, 1808.

Test. Brit. Suppl., p. 69, 1808; Forbes and Hanley, *Brit. Moll.* **2**; pl. 45, fig. 2.

Shell longitudinally ovate, with the umbo at the smaller end; sides equal. It is very thin, pellucid, of a pearly white when divested of the epidermis, which is of a pale olive brown; and is finely striated longitudinally, crossed by more minute striæ in a transverse direction, that give it a decussated appearance when examined under a microscope. The inside is smooth with a nacred gloss; at the hinge is a slight indenture, the margin contiguous and slightly denticulated; near the front margin is a singular, reflected transverse ridge, but whether this is a constant character, or accidental, cannot be determined; indeed only one valve of this curious little shell has come under examination, and that through the favor of Mr. Laskey, who found it in sand on the Scottish coast. Length, about ⅛ of an inch; and not quite so broad. (Montagu.)

This pretty little species is very ventricose at the umbos, whence its convexity regularly and gradually diminishes in all directions. Its valves are thin and fragile, yet not particularly so for their minute size, and are covered with a dull ashy olivaceous or pale olive-coloured epidermis, beneath which the surface appears white. The very many raised and somewhat granulated striæ, which radiatingly adorn the entire exterior, are all nearly equally strong, more or less divergent and very closely disposed, since the interstices, as they widen, become filled up with intermediate costellar striæ; the granules are much crowded, and very minute. (Brit. Moll.)

TYPE in British Museum? Type locality, Scottish Coast.

RANGE. Bering Sea to Puget Sound and San Pedro, California. Also in the Atlantic.

Crenella leana Dall, 1897.

Bull. Nat. Hist. Soc. Brit. Col., **2**:4; pl. 1, figs. 6, 7.

Shell small, plump, ovate, nearly smooth, with a brilliantly polished olivaceous epidermis; beaks prominent, terminal; sculpture of delicate, concentric incremental lines, which at irregular intervals are sharply impressed, crossed by obsolete radial striæ which are hardly perceptible except on the beaks, near the margin of the valves and at the impressed lines; margin of the valves microscopically dentate; ligament sub-internal, inconspicuous; hinge line thickened below the beaks and perceptibly, minutely dentate; muscular impression ovate, rather large; interior of the shell obscurely pearly. Extreme length, 5; height, 3.5; diameter, 3 mm. (Dall.)

TYPE in U. S. N. M. Type locality, near Middleton Island, Alaska.

RANGE. Aleutian Islands, eastward to Middleton Island, Alaska.

Crenella columbiana Dall, 1897.

Plate 15, fig. 4.

Bull. Nat. Hist. Soc. Brit. Col., **2**:4; pl. 1, figs. 3, 5.

Shell large for the genus, inflated, elongate, oval, thin, of a delicate greenish-gray tint, usually somewhat stained by blackish blotches; umbos conspicuous, prosogyrous, terminal; surface of the shell entirely covered with fine radiating threads, like those of *C. decussata,* but proportionately more delicate; concentric sculpture, only of delicate incremental lines; margin of the valves extremely thin and minutely denticulate; a small portion immediately under the beaks thickened; ligament rather long, deep-seated, hardly visible externally; interior pearly, the muscular and pallial impressions hardly visible, close to the margin. Extreme length, 16; height, 12; diameter, 9.5 mm. (Dall.)

TYPE in U. S. N. M. Type locality not stated.

RANGE. Aleutian Islands to San Diego, California.

Crenella grisea Dall, 1897.

Plate 3, fig. 1.

Smithsonian Misc. Coll., **50**:406.

Shell thin, oblique, elongate, rounded-quadrate when adult, the young specimens relatively shorter; surface of a grayish olivaceous color, with lighter and darker zones, brilliantly polished, with faint, irregular traces of fine, obsolete, radial striation; beaks inconspicuous, hinge line gently arcuate, with a minutely denticulate small lamella directly under the beaks; the margin behind the beaks with narrow internal elongate ligament, behind which are sharp, minute, interlocking denticulations of the margin,

beyond which the margin is minutely crenulate; interior bluish perlaceous; hinge line behind the beaks slightly rounded and produced, but not quite angulate. Longest extension of shell, 12; dimension at right angles to this, 8.5; diameter, 7 mm. (Dall.)

TYPE in U. S. N. M., Nos. 110464 and 110465. Type locality, Stations 4782 and 4784 off east end of Attu Island in 57 and 135 fathoms.

RANGE. Bering Sea to Sitka, Alaska.

Crenella rotundata Dall, 1916.

Proc. U. S. N. M., **52**:406.

Shell small, rounded-quadrate, inflated, with a very thin, dehiscent, pale-olive periostracum; beaks central, inconspicuous, with no crenulations beneath them; sculpture of faint incremental lines and obsolete, radial striæ near the margin; inner margin very delicately crenulate except near the beaks. Length, 4; breadth, 4; diameter, 2 mm. (Dall.)

TYPE in U. S. N. M., No. 129305. Type locality, Station 2849 off Santa Cruz Island, California.

RANGE. Known only from the type locality.

Crenella divaricata Orbigny, 1846.

Moll. Cuba, **2**:311; pl. 27, figs. 56–59.

Testa globulosa, subcirculari, albida, radiatim costata; costis transversim granulosis, in medio divaricatis; latere buccalis brevi rotundato; latere anali elongato; umbonibus elevatis, contortis. Diameter, 3 mm. (Orbigny.)

This little shell is not to be distinguished, except by its nearly white color, from the young of *C. decussata* of the same size. The young *divaricata* is proportionately less inflated and has a more circular outline than the full-grown shell. The color is yellowish or nearly white in all the specimens I have seen, and the epidermis hardly perceptible. (Dall.)

TYPE. Neither the location of the type nor the type locality is known to the present writer.

RANGE. Santa Barbara Islands to Panama Bay. Also West Indies.

Family PERIPLOMATIDÆ.

Genus **PERIPLOMA** Schumacher, 1817.

Shell oval, very inequivalve, inequilateral, slightly nacreous; left valve deepest; posterior side very short and contracted; hinge with a narrow, oblique, spoon-shaped process in each valve, and a small triangular ossicle; an internal rib proceeds from under the hinge to the posterior margin; muscular impressions unequal, the anterior long and narrow, the

posterior small, semi-lunar; pallial impression marginal. Siphons long and slender, separate. (Tryon. S. S. Conch.)

TYPE. *Periploma inæquivalvis* Schumacher.

DISTRIBUTION. United States, West Indies, Panama, South America.

Periploma discus Stearns, 1890.

Plate 43, figs. 1, 3.

Proc. U. S. N. M., 13:222; pl. 16, figs. 1, 2.

Shell thin, fragile, white, translucent, semi-nacreous; inequilateral, nearly circular, being posteriorly sub-angulated and flexuously squarish and produced; inequivalve, the left valve being more ventricose than the right; valves somewhat gaping; pallial impression narrow, shiny, distinct; sinus rather deep and rounded interiorly and curving up to the adductor scar; beaks small, nearly central, fissured; hinge a hollowed, spoon-shaped process (projecting inward from below the beaks), which holds the cartilage; this spoon-shaped cartilage cup or process is strengthened by an elongated callus slanting anteriorly; the exterior surface of the valves is finely wrinkled and linearly scabrous (more easily seen by holding a valve up to the light) and otherwise marked by concentric lines and zones of growth. Length, 41; height, 36; diameter, 14.50 mm. (R. E. C. Stearns.)

TYPE in U. S. N. M., No. 105391. Type locality, Long Beach, California.

RANGE. San Pedro to San Diego, California.

Periploma planiuscula Sowerby, 1834.

Plate 22, fig. 1.

Proc. Zool. Soc., p. 87, 1834. *Jour. Acad. Nat. Sci. Phila.*, 7; pl. 18, fig. 8.

Per testa oblonga, planiusculta, inequivalvi, albicante, impolita, tenuiscula; latere antico brevi, subrugoso; marginibus, antica subdeclivi subtruncata dorsali rectiuscula; epidermide tenui, pallescente. Long., 2.4; lat., 0.8; alt., 1.8 poll. (Sowerby.)

Shell of medium size, elliptical, inequilateral, inequivalve, fragile; umbos small, anterior to center; posterior extremity long and evenly rounded, but produced farthest a little above the middle; anterior portion much shorter than posterior, faintly biangulated; surface sculptured by fine concentric, incremental lines; hinge a hollow, spoon-shaped process, projecting inward from below the umbos; this cartilage process is strengthened by an elongated callus slanting anteriorly; pallial sinus short, cuneiform. (Arnold.)

TYPE in British Museum. Type locality, St. Elena, Ecuador.

RANGE. San Pedro, California, to Guayaquil, Ecuador. In the Pleistocene at San Pedro and San Diego, California.

SECTION HALISTREPTA Dall, 1904.

Periploma sulcata Dall, 1904.

Plate 40, fig. 6.

The Nautilus, **17**:122. *Bull. Comp. Zool.*, **43**; pl. 15, fig. 10.

Shell rotund, white, with the left valve flatter, thin, sculptured with numerous, close-set, irregularly concentric, more or less interrupted, low ridges, separated by sub-equal, shallow interspaces; the surface is also microscopically shagreened, and there is a low rib extending from the beak to the lower margin of the ill-defined rostrum and an ill-defined furrow radiating from the beak toward the anterior base, in the right valve; beaks low, distinctly fissured; anterior dorsal hinge line rounded, posterior ditto, shorter, nearly rectilinear, forming with the elevated rib a sub-triangular space which is free from the undulations which cover the rest of the shell; interior shining, hardly nacreous, the muscular impressions very small, the pallial line obscure; chondrophores prominent, spoon-shaped, extending obliquely forward, and with their connecting resilium sustaining a proportionately large triangular lithodesma; the chondrophores are supported behind by well-developed clavicular props, which are inserted posteriorly on the surface of the valve below the linear hinge line. Length, 32; height of right valve, 6, and of left valve, 4 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Terminal Island, San Pedro, California.

RANGE. Known only from the type locality.

Family THRACIDÆ.

Genus **THRACIA** (Leach) Blainville, 1824.

Shell concentrically striated, with more or less fine, superficial granulation and a very delicate periostracum, sub-rostrate, slightly gaping behind; slightly inequivalve, the right valve larger; the beaks in contact and usually perforated by friction on each other, the hinge plate fissured below them and edentulous; the ligament external, the resilium more or less sunken and, in most cases, with a short, transverse lithodesma in front of it, occupying the fissure in the hinge plate; pallial line with a moderate sinus, margins of the valves entire; the nymphs in the typical forms do not project greatly from the hinge margin ventrally and are more or less elongated; the shell is destitute of nacre.

TYPE. *Thracia corbuloides* Blainville.

DISTRIBUTION. Greenland, United States, Norway, Britain, Mediterranean, Canaries, China.

RANGE IN TIME. In the Triassic and Pleistocene.

Thracia curta Conrad, 1837.

Plate 43, fig. 6.

Jour. Acad. Nat. Sci., Phila., 7:248; pl. 19, fig. 8.

Shell sub-oval; anterior margin obtusely rounded; posterior margin direct, sub-rectilinear; umbonal slope angular. Additional description: shell chalky white, with a dehiscent brownish periostracum slightly inequivalve. Length, 30; height, 20; diameter, 13 mm. (Conrad.)

TYPE in Acad. Nat. Sci. Phila.? Type locality, near Santa Barbara, California.

RANGE. Icy Cape, Arctic Ocean, Bering Sea, to San Diego, California.

Thracia trapezoides Conrad, 1840.

Plate 43, fig. 8.

Wilkes Exped., p. 723; Atlas, pl. 17, fig. 6.

Trapezoidal; ventricose; flank flattened, carinate, side anteriorly compressed. Surface faintly, concentrically undulate, and neatly but unequally marked with concentric striæ. Beaks prominent, medial. Posterior margin truncated, basal margin tumid at middle. Described from a fossil. Length, 48; height, 38; diameter, 16 mm. (Conrad.)

TYPE in U. S. N. M.? Type locality, Astoria, Oregon, Miocene.

RANGE. Living in Puget Sound. Fossil in the Pliocene at Eagle Prairie, Humboldt County, and San Pedro, California. In the Miocene in Oregon, and at Blakely, near Seattle, Washington.

Thracia challisiana Dall, 1915.

Plate 43, fig. 7.

Proc. U. S. N. M., 49:443. *Rep. Puget Sound Moll.;* pl. 7, fig. 1.

Shell large, chalky, sub-quadrate, almost equivalve, the posterior end longer, surface covered with a coarse, almost imbricating granulation, without radial elevations or defined dorsal areas. Both ends are rounded; there is no distinct posterior truncation, though that end is blunter than the anterior; resilium and ligament marginal, inconspicuous, with no indication of a lithodesma; pallial sinus wide, shallow, reaching only halfway from the posterior end to the vertical of the beaks. Length, 45; height, 33; diameter, 20; vertical from the beaks 25 mm. in front of the posterior end. (Dall.)

TYPE in U. S. N. M., No. 272096. Type locality, San Juan Island, Washington.

RANGE. Forrester Island, Alaska, to the Gulf of Georgia.

Thracia beringi Dall, 1915.

Plate 43, fig. 4.

Proc. U. S. N. M., 49:442.

Shell of moderate size, white, with a dehiscent, yellowish periostracum (usually lost), and looking much like a *Macoma sabulosa*. Valves nearly equal, nearly equilateral, with low beaks and a conspicuous, external ligament enfolding the resilium. Surface with incremental irregularities and in the periostracum numerous small wrinkles, but without perceptible granulation. Pallial sinus large, rounded, not reaching the vertical from the beaks. Valves rounded at both ends, the posterior dorsal area inconspicuous, not bounded by a rib, and there is no indication of a lithodesma. Length, 35; height, 25; diameter, 12; vertical from the posterior end, 16 mm. (Dall.)

TYPE in U. S. N. M., No. 221555. Type locality, Commander Islands.

RANGE. Bering Sea, Aleutian Islands and southward to Sitka, Alaska.

Thracia diegensis Dall, 1915.

Proc. U. S. N. M., 49:443.

Shell very thin and small, whitish or brownish, usually with a deposit of rusty orange color about the margin; valves moderately, sub-equally convex, the anterior end longer, the posterior end attenuated and squarely truncate; posterior dorsal area defined by a raised thread on each valve; surface smooth, except for incremental irregularities; beaks prominent, no perceptible granulations; hinge linear and very feeble, the resilifer not projecting; in the cavity of the beak a short line of brown matter resembling cement extends downward, which indicates the attachment of a widely V-shaped lithodesma which is usually lost; pallial sinus deep, reaching beyond the vertical of the beaks; base of valves nearly straight. Length, 9; height, 7; diameter, 4 mm. (Dall.)

TYPE in U. S. N. M., No. 73604. Type locality, San Diego Bay, California.

RANGE. Known only from the type locality.

Genus **CYATHODONTA** Conrad, 1849.

Shell like *Anatina* in form; hinge with a broad, not very projecting, fossette which is carinated near the margin; muscular impressions rounded, indistinct; pallial impression with a large, rounded sinus.

TYPE. *Cyathodonta undulata* Conrad.

DISTRIBUTION. China, California, Lower California, Honduras.

Cyathodonta dubiosa Dall, 1915.

Plate 9, fig. 5.

Proc. U. S. N. M., **49**:445.

Shell in general resembling *C. undulata* on a smaller scale. The left valve is nearly as convex as the right valve. The plaits are less regular, becoming obsolete behind and toward the basal margin. The left valve has only two very faint rays, the right valve also two, of which the dorsal one is strong. The granulation is in somewhat irregular concentric lines and not radially distributed; the pallial sinus is not so high relatively and falls short of reaching the vertical of the beaks. Length, 38; height, 29; diameter of right valve, 9; of left valve, 7 mm. (Dall.)

TYPE in U. S. N. M., No. 96450. Type locality, off La Paz, Lower California.

RANGE. San Pedro, California, to the Gulf of California.

Cyathodonta pedroana Dall, 1915.

Plate 54, figs. 1, 2, 3.

Proc. U. S. N. M., **49**:445.

Shell small, white, resembling *C. dubiosa* but more pointed behind, hardly truncate, anterior end longer; valves nearly equally convex; the plaits are more numerous (±25), narrower, more close-set and more regular; they reach the posterior dorsal margin; the rays are obscure; the ganulations obscurely, concentrically disposed; the sinus is small, shallow and does not reach the vertical of the beaks. Length, 27; posterior end to vertical, 10; height, 21; diameter of right valve, 6; of left valve, 5 mm. (Dall.)

TYPE in U. S. N. M., No. 207527. Type locality, San Pedro Harbor, in mud.

RANGE. San Pedro Harbor and Catalina Island, California.

Genus **ASTHENOTHÆRUS** Carpenter, 1864.

Shell like a *Thracia*, hinge without teeth, spongy cartilage situated in a pit under the umbos.

TYPE. *Asthenothærus villosior* Carpenter.

DISTRIBUTION. California to Cape San Lucas, Lower California.

Asthenothærus villosior Carpenter, 1864.

Ann. Mag. Nat. Hist., (3) **13**:311.

Testa inæquivalvi, inæquilaterali, umbonibus ad trientem longitudinis sitis; tenuissima, alba (sublente), omnino minutissime et creberrime pustulosa; rugis incrementi obtussimis, irregularibus, maxime t. juniore,

ornata; epidermide tenui, pallide olivacea induta; parte postica truncata, parum hiante; antica valde rotundata; marginibus dorsalibus et ventali parum excurvatis; umbonibus angustissimis; regionibus lunulari et nymphali subcarinetis; intus, margine cardinali utriusque valvæ acuto; ligamento inconspicuo; cartilagine subspongiosa, satis elongata, postice deflecta; fovea haud indentata; cicatricibus adductorum parvis, subrotundatis; sinu pallii majore, ovali, ad dimidium interapatii porrecto. Long., 38; lat., 26; alt., 14; poll. (Carpenter.)

TYPE in U. S. N. M. Type locality, Cape San Lucas, Lower California.

RANGE. San Pedro, California, to Cape San Lucas, Lower California.

Family PANDORIDÆ.

Genus **PANDORA** Bruguière, 1792.

Shell inequivalve, thin, pearly inside; valves close, attenuated behind; right valve flat, with a diverging ridge and cartilage furrows; left valve convex, with two diverging grooves at the hinge; usually no ossicle; pallial line slightly sinuated. Outer layer of regular vertical, prismatic cells.

TYPE. *Tellina inæquivalvis,* Linné.

DISTRIBUTION. United States, Spitzbergen, Jersey, Canaries, India, New Zealand, Philippines, Panama.

Subgenus KENNERLYIA Carpenter, 1864.

Pandora grandis Dall, 1877.

Plate 15, fig. 10.

Proc. Cal. Acad. Sci., 7:11. Publ. Puget Sound Biol. Station, 4; pl. 4, fig. 3, 1924.

Shell large, plano-convex, not rostrate, dorsal margin of the convex valve angulated with reference to the longitudinal axis of the shell, as well as bent over the umbo of the flat valve so as to completely overshadow it. Convex valve externally smooth except for lines of growth, chalky, somewhat twisted. From the umbo an incised line passes to the ventral margin where it ends; the portion of the ventral margin behind the point marked by the end of this line extends ventrally some distance beyond the limit reached by that portion anterior to it. The anterior portion is equal to the flat valve so much that in life it appears as if part of the anterior ventral margin had been broken or cut out. The outer surface of the anterior area bounded by the incised line has also its lines of growth more regularly distributed, giving the appearance of light concentric sculpture, and usually retains the epidermis longer than the remainder of the valve, which is more convex. The interior of this valve is livid pearly, sparsely punctuate, and with the spectral grooves radiating from the hinge teeth. These are so faint that they can be seen in some lights,

but not felt. They correspond to the points of attachment of the mantle. The flat valve has the ventral margin rather evenly curved, with no sinus. The dorsal margin is bent over at a right angle behind the hinge, and angulated at the umbo. The surface is marked by an area corresponding to that on the convex valve, and with a similar concentric striation, but not separated from the rest by an incised or any other definite line. Behind the area thus marked the flat valve is a little concave, marked by faint, concentric waves and radiating, irregular lines, marked on the shell by a light groove, but carrying a raphe of epidermis. Interior pearly, with the anterior tooth very strong. Length, 2.2; depth, hinge to ventral margin of convex valve before the sinus, 1.5; behind the sinus, 1.04; diameter, 0.38 inches. (Dall.)

TYPE in U. S. N. M., No. 171069. Type locality, Unalaska.

RANGE. Pribiloff Islands, Bering Sea, to Sileta Bay, Oregon.

Pandora filosa Carpenter, 1864.

Plate 33, figs. 2a, 2b.

Proc. Zool. Soc., p. 602, 1864, Arnold, *Pal. San Pedro;* pl. 18, fig. 3.

P. t. tenui, plano-convexa, maxime rostrata; marginibus dorsalibus rectis, ad angulum circ. 160; ventrali regulariter et modice excurvato, postice vix sinuato; epidermide olivacea, plerumque erosa, postice corrugata; lamina externa prismatica spongiosa; valva planata radiatim sulcata (quasi filosa), sulcis distantibus; valva convexa, costa obtusissima postice decurrente; lineis seu undis incrementi conspicuis: intus dente cardinali uno, parvo, extante; callositate claviculoidea antica, margini contigua; fossa cartilaginea postice sita; cicatricibus adductorum rotundatis, margini dorsali contiguis; linea pallii simplici. Long., 8; lat., 4; alt., 12 poll. (Carpenter.)

Shell small plano-convex, elongate-oval, thin, umbos minute, about one-fourth length from anterior extremity; anterior and posterior dorsal margin straight, making an angle of 160 degrees at the umbo; ventral margin arcuate; posterior extremity long, narrowed and truncated at the end; anterior rounded up from the base but making an angle with the dorsal margin; a single prominent posterior, submarginal ridge runs from umbo to the extremity of each valve, being nearer the margin in flat valve; surface of both valves sculptured by numerous fine, concentric, incremental lines, and that of the right valve by fine radiating sulcations; left valve with a thin ossicle; right valve with two ossicles, the anterior one being short. (Arnold.)

TYPE in British Museum? Type locality, Puget Sound.

RANGE. Nunivak Island, Bering Sea, to San Pedro, California.

Pandora glacialis Leach, 1819.

Plate 15, fig. 11, and plate 42, figs. 3, 4.

Jour. Phys., **88**, p. 465. Sowerby, *Spec. Conch.*; figs. 4–6.

Shell broad, rather short, ventricose, rather thick, wrinkled concentrically, anterior side with a very slight corner, impressed with a slightly radiating groove, situated at the margin; posterior side broader, very shortly beaked, obtuse, rayed near the margin with two rather nodulous ribs, convex at the ventral margin; left valve deep, without teeth; right valve with one tooth; cartilage inserted in a pit; thickened at the sides with a calcareous layer. (Conch. Iconica.)

TYPE in British Museum? Type locality, Spitzbergen.

RANGE. Arctic Ocean to Juan de Fuca Strait. Also Atlantic.

Pandora glacialis eutænia Dall, 1915.

Proc. U. S. N. M., **49**:449.

This variety, with a more rostrate posterior end and averaging larger than the typical form, was obtained at Port Etches and eastward at Sitka. (Dall.)

TYPE in U. S. N. M., No. 171062. Type locality, Port Etches, Alaska.

RANGE. Port Etches to Sitka, Alaska.

Pandora bilirata Conrad, 1855.

Plate 53, figs. 8, 9.

Proc. Acad. Nat. Sci. Phila., **7**:267. *Pacific R. R. Reps.*, **6**; pl. 5, fig. 25.

Oblong, very inequilateral, contracted anteriorly, convex medially; posterior side with two distant, carinated lines toward the hinge margin which is straight and not oblique; posterior extremity truncated. Length, 15; height, 6 mm. (Conrad.)

TYPE in Acad. Nat. Sci. Phila.? Type locality, California.

RANGE. Forrester Island, Alaska, to Point Abreojos, Lower California.

Pandora granulata Dall, 1915.

Proc. U. S. N. M., **49**:449.

Shell closely resembling in form the *bilirata*, but much smaller, more translucent and of a greenish tint, with the base and dorsal margins more nearly parallel and with the elevated liræ of the posterior dorsal surface delicately granulated. Length, 8.5; height, 4; diameter, 1; beaks behind the anterior end, 1 mm. (Dall.)

TYPE in U. S. N. M., No. 211348. Type locality near La Paz, Lower California.

RANGE. Santa Barbara, California, to the Gulf of California.

Pandora forresterensis Willett, 1918.

Plate 53, figs. 4, 5.

The Nautilus, **31**:134.

Shell moderately heavy; short and deep (depth in twelve typical specimens averaging .67 of length). Color white, with brownish periostracum generally visible on both ends but most conspicuous on posterior. Left valve moderately convex, except for rather faint, incremental lines. Right valve flat or slightly convex, except near basal margin where it becomes abruptly concave; smooth except for several (generally 7-9) irregular, impressed lines running from apex to basal margin. Length, 22; height, 15; diameter, 5; beaks, behind anterior end, 6 mm. (Willett.)

Type in Acad. Nat. Sci. Phila. No. 118200. Paratypes are in Cal. Acad. of Sci. and in the Willett Collection.

Type locality, Forrester Island, Alaska.

Range. Known only from the type locality.

Subgenus Heteroclidus Dall, 1915.

Pandora punctata Conrad, 1837 (not Carpenter, 1864).

Plate 53, figs. 6, 7.

Jour. Acad. Nat. Sci. Phila., **7**:228; pl. 17, fig. 1.

Shell much compressed; posterior side produced, extremity rostrate, truncated; ligament margin recurved, sub-margin carinated; within punctate; cardinal teeth three in the superior valve; in the inferior, one elongated oblique tooth. Length, 1½ inches. (Conrad.)

Type in Acad. Nat. Sci. Phila. or State Museum at Albany. Type locality, near Santa Barbara, California.

Range. Vancouver Island to the Gulf of California.

Family LYONSIIDÆ.

Genus **LYONSIA** Turton, 1822.

Shell nearly equivalve, left valve largest, thin, subnacreous, close, truncated posteriorly; cartilage plates oblique, covered by an oblong ossicle; pallial sinus obscure, angular. Structure intermediate between *Pandora* and *Anatina;* outer layer composed of definite, polygonal cells.

Type. *Mya striata* Montagu.

Distribution. Greenland, North Sea, Norway, West Indies, Madeira, India, Borneo, Philippines, Peru, California, Oregon, Washington. Fossil Miocene, Pleistocene.

Range in time. In the Miocene and Pleistocene.

Lyonsia pugetensis Dall, 1913.

Plate 28, fig. 2.

Proc. U. S. N. M., **45**:595. *Rep. Puget Sound Shells;* pl. 2, fig. 3.

Shell large, thin, pearly under a thin, olivaceous, gray periostracum which is covered with fine radial lines to which fine sand adheres strongly, so that an attempt to remove the sand destroys the greater part of the periostracum; the shell is slightly inequivalve and very inequilateral, the anterior end being much the shorter; the periostracum projects over the shelly margin; the anterior end is evenly rounded, the posterior rostrate, the beaks not conspicuous; the base is convexly arcuate in the middle, but is rapidly attenuated toward the rostrum, which is terminally truncated; interior pearly, pallial area relatively small within the somewhat irregular unsinuated pallial line; hinge edentulous with a small narrow lithodesma. Length of shell, 36; of anterior portion, 15; height at beaks, 17; maximum diameter, 10 mm. (Dall.)

TYPE in U. S. N. M., No. 249966. Type locality, Coast of Washington.

RANGE. Chignik Bay, Alaska, to Puget Sound.

Lyonsia californica Conrad, 1837.

Plate 27, fig. 3.

Jour. Acad. Nat. Sci. Phila., **7**:248; pl. 19, fig. 20.

Shell produced, equivalve; posterior side narrowed, truncated at the extremity; umbo inflated; epidermis with radiating striæ. Length, 1½ inches. (Conrad.)

TYPE in U. S. N. M., No. 253111. Type locality, near Santa Barbara, California.

RANGE. Puget Sound to Todos Santos Bay, Lower California.

Lyonsia californica haroldi Dall, 1915.

Proc. U. S. N. M., **49**:453.

Shell with nearly cylindrical form without arcuation. (Dall.)

TYPE in U. S. N. M. Type locality, San Francisco Bay, California.

RANGE. Known only from the type locality.

Lyonsia (californica var.?**) nesiotes** Dall, 1915.

Proc. U. S. N. M., **49**:453.

Shell very thin, small, translucent; with the beaks very close to the anterior end; it may prove to be distinct. (Dall.)

TYPE in U. S. N. M., No. 206410. Type locality, Catalina Island, California.

RANGE. Catalina Island, California; Coronado Islands and Magdalena Bay, Lower California.

Lyonsia arenosa Möller, 1842.

Index Moll. Grönl., p. 20. *Zool. Beechey's Voy.;* pl. 43, fig. 3.

Testa transversini ovata, inæquilatera, ventricosiori, opaca, alba, antice obtusa, postice dilatata, superne subangulata, vix hiante; epidermide cinerea, arena agglutinata. Diameter, 6.5. (Möller.)

This yellowish, short and solid species is well distinguished from any of the others. Cat. No. in U. S. N. M. 223476. (Dall.)

TYPE locality, Atlantic.

RANGE. Arctic Sea to the Aleutian and Kodiak Islands, Alaska. Also Japan and Circumboreal.

Lyonsia gouldii Dall, 1915.

Mex. and Cal. Shells, p. 17; pl. 15, fig. 6 (new name for *L. nitida* Gould, 1851).

T. transversa, subfalcata, ventricosa, tenuis, lucida vivde margaritacea, concentrice undulata, plerumque nuda; apice ad trientem anteriorem; extremitate antica rotundata; extrem. postica attenuata, truncata, subadscendente, utraque extremitate lineis radiatibus remotis striata. Long., $\frac{7}{8}$; lat. et alt., $\frac{3}{7}$ poll. (Gould.)

More inequilateral, more recurved, more pearly and free from striæ than *O. hyalinum.* The species was described as *Osteodesma nitidum* Gould.

TYPE locality, Santa Barbara, California.

RANGE. San Francisco Bay to Point Abreojos, Lower California.

Lyonsia striata Montagu, 1815.

Trans. Linn. Soc., **2**:188; pl. 13, figs. 1, a.

Shell small, slender, with the posterior dorsal margin nearly straight and more sharply truncate, while in *L. norvegica* it is concavely arcuate; the test is almost translucent, the form less inflated, the dorsal and, in many cases, the basal edges near the margin, conspicuously compressed, the umbos nearer the anterior end; and the surface with usually a much greater profusion of adherent sand grains than in *L. norvegica.* (Montagu.) Cat. No. in U. S. N. M., 213722.

TYPE locality, Atlantic.

RANGE. Aleutian Islands to Juan de Fuca Strait. Circumboreal.

Subgenus ALLOGRAMMA Dall, 1903.

Lyonsia amabilis Dall, 1913.

Proc. U. S. N. M., **45**:594.

Shell thin, with a pale, olivaceous periostracum and pearly interior, the lithodesma small. The sculpture resembles closely that of the type group,

L. (A) formosa Jeff., from the Canaries, but differs in the following details; the anterior transverse ripples, the central nodulous ray, and the radial ridge below the posterior dorsal area are more vertically directed; on the latter area there is only faint indication of the radial ribbing which in *L. formosa* is distinct and minutely spinose; the anterior end is longer than the posterior, while in *formosa* the reverse is the case; the coloration of the periostracum is olivaceous green while in *formosa* it is ferruginous brown. Length, 23; height, 15; diameter, 12 mm. (Dall.)

TYPE in U. S. N. M., No. 267171. Type locality, off Santa Barbara Channel, California.

RANGE. Known only from the type locality.

Subgenus ENTODESMA Philippi, 1845.

Lyonsia inflata Conrad, 1837.

Jour. Acad. Nat. Sci. Phila., 7:248; pl. 19, fig. 10.

Shell sub-elliptical, inflated; concentric rugæ distinct; ligament margin convex; basal margin gibbous; posterior extremity truncated; cardinal appendage dilated. (Conrad.)

TYPE in Acad. Nat. Sci. Phila.? Type locality, Guayaquil, Ecuador.

RANGE. In sponges, Vancouver Island, British Columbia, to Guayaquil, Ecuador.

SECTION AGRIODESMA Dall, 1909.

Lyonsia saxicola Baird, 1863.

Proc. Zool. Soc., p. 70.

Shell oblong-ovate, gibbous in the center, produced anteriorly, compressed posteriorly and gaping. The beaks are large and incurved; it is covered with an olive-colored epidermis, which is striated transversely. The ventral margin is gaping and flexuous. The substance of the shell, without being very thin, is exceedingly brittle and cracks very easily. The ossicle covering the front of the internal cartilage is strong and well developed. Length, 100; height, 50; diameter, 35 mm. (Baird.)

TYPE locality, Esquimalt Harbor, Vancouver Island.

RANGE. Aleutian Islands to San Pedro, California.

Lyonsia scammoni Dall, 1871.

Amer. Jour. Conch., 7:142; pl. 16, fig. 3.

Shell equilateral, inequivalve, sub-ovate. Left valve slightly the smaller. Shell tumid, umbos inconspicuous, nearly in the middle of the shell. Interior with a brilliantly pearly, white nacre; hinge margin narrow, nearly straight; interrupted under the beaks; right valve with a small,

rounded projecting process, fitting into an excavation in the opposite valve, which is thickened behind it. Ligament and ossicle moderate. Pallial line simple, continuous. Anterior margin evenly rounded; posterior ditto, a little more effuse; ventral margin with the faintest possible indication of flexuosity; shell gaping behind, but with no perceptible ventral gape. Exterior smooth except for lines of growth, which are more emphasized at intervals, forming three concentric waves from the umbo toward the margin. Shell covered with a thin yellowish-brown, pubescent epidermis, which is produced over the margins, and under a lens is seen to be very closely, finely, radiately striate. The pubescence is formed by little projecting points of the epidermis at the intersections of the striæ with the lines of growth. Shell solid. Long., .9; alt., .44; diameter, .33 in. (Dall.)

TYPE in U. S. N. M. Type locality, Port Simpson, British Columbia.

RANGE. Port Simpson, British Columbia, to San Diego, California.

Genus **MYTILIMERIA** Conrad, 1837.

Shell equivalve, sub-oval, thin, beaks sub-spiral; hinge edentulous, with a slight linear cavity under the beaks; muscular impressions two, rather small; pallial impression with a broad obtuse sinus. Animal gregarious, forming a nest.

TYPE. *Mytilimeria nuttallii* Conrad, 1837.

DISTRIBUTION. West coast of United States, in compound Ascidians.

Mytilimeria nuttallii Conrad, 1837.

Jour. Acad. Nat. Sci. Phila., 7:247; pl. 19, fig. 5.

Shell sub-oval, inflated, thin, fragile; white, a very thin, yellowish, deciduous epidermis. Length, 30; height, 31; diameter, 16 mm. (Conrad.)

TYPE in U. S. N. M., No. 74234. Type locality, Coast of California.

RANGE. Vancouver Island to San Diego, California.

Family POROMYACIDÆ.

Genus **POROMYA** Forbes, 1844.

Shell suborbicular, subequivalve, and inequilateral, thin, transparent, slightly nacreous within; valves closed, surface granulated; teeth, in right valve a short but strong cardinal, and in the left a minute triangular cardinal and a ridge-like lateral on the posterior side.

TYPE. *Poromya anatinoides* Forbes.

DISTRIBUTION. Britain, Scandinavia, Mediterranean, tropical America, Pacific Northwest America.

Subgenus DERMATOMYA Dall, 1908.

Poromya tenuiconcha Dall, 1913.

Plate 54, figs. 24 to 26.

Proc. U. S. N. M., **45**:596.

Shell small, thin, olivaceous, the pearly luster showing through the periostracum; equivalve, inequilateral, anterior end shorter, rounded in front; posterior end longer, roundly truncate; beaks prominent, prosocœlous, with a marked but uncircumscribed depression in the lunar region in front of them; interior pearly, brilliant; margins simple, sharp; hinge in the left valve with a small internal resilium seated on an inconspicuous oblique chondrophore, with a notch immediately in front of it, into which fits a projecting denticle on the corresponding part of the opposite valve. Length of shell, 16; anterior portion, 6; height, 13; diameter, 10 mm. (Dall.)

TYPE in U. S. N. M. Type locality, off Monterey Bay, in deep water.

RANGE. Alaska Peninsula to the Coronado Islands, Lower California, in deep water.

Poromya buttoni Dall, 1916.

Proc. U. S. N. M., **52**:406.

Shell small, rounded-quadrate, plump, thin, yellowish olive, hardly polished, smooth, with iridescent reflections from under the periostracum when fresh; beaks nearly central, not prominent, hinge teeth normal, strong; interior bluish white, margins entire, pallial sinus shallow. Length, 9.8; breadth, 8; diameter, 6 mm. (Dall.)

TYPE in U. S. N. M., No. 194309. Type locality, Station 3670, Monterey Bay, in 581 fathoms.

RANGE. Known only from type locality.

Poromya beringiana Dall, 1916.

Proc. U. S. N. M., **52**:406.

Shell large, thin, plump, inequilateral, anterior end shorter, base arcuate, anterior end rounded, posterior dorsal slope first convexly slightly arcuate, then rounded obliquely subtruncate to meet the basal curve; beaks prominent, 7 mm. behind the anterior end; surface smooth, except for faint incremental irregularities, iridescent under a pale olive, polished periostracum; beaks slightly prosocœlous, hinge weak, the teeth minute, the ossiculum well developed; interior whitish, the pallial sinus very shallow. Length, 20; height, 14; diameter, 12 mm. (Dall.)

TYPE in U. S. N. M., No. 205899. Type locality, Bowers Bank, Bering Sea, in 557 fathoms.

RANGE. Aleutian Islands to Tillamook, Oregon.

Poromya leonina Dall, 1916.

Plate 11, fig. 3.

Proc. U. S. N. M., **52**:406.

Shell large for the genus, mactriform, solid, inflated, transverse, with a dull olivaceous periostracum, darker, and concentrically wrinkled on the posterior dorsal area; surface smooth except for fine incremental lines and microscopic radial striulæ often obsolete; beaks high, slightly prosocœlous, nearly central; base moderately arcuate, anterior end rounded, dorsal slopes nearly straight, a shallow radial depression on the posterior dorsal area, posterior end subtruncate; hinge weak, ligament deeply inset; hinge almost obsolete; margins entire, pallial sinus shallow, interior feebly iridescent white. Length, 27; height, 18.5; diameter, 14.6 mm. (Dall.)

Type in U. S. N. M., No. 122564. Type locality, Station 3074, off Sea Lion Rock, coast of Washington, in 877 fathoms.

Range. Known only from the type locality.

Genus **CETOCONCHA** Dall, 1889.

Shell differing from *Poromya* proper by the cartilage being almost external and the fossettes diminished in size and upturned, the external ligament consequently nearly obsolete; the dentition obsolete except the cardinal tooth of the right valve, which itself is sometimes absent in the adult, though observable in the young; other shell characters much as in *Poromya*. (Dall.)

Type. *Lyonsia bulla* Dall.

Distribution. West Indies, and southwest of Sitka, Alaska.

Cetoconcha malespinæ Dall, 1916.

Proc. U. S. N. M., **52**:407.

Shell small, very thin, with prominent prosocœlous beaks, a very pale yellowish olive periostracum, darker on the posterior dorsal area; in the right valve is a strong radial ridge near the posterior hinge line; surface otherwise smooth and almost polished except for extremely fine radial lines of minute granules only visible under a glass; shell very similar to *Isocardia cor* in form and outline on a very small scale; interior white, the hinge normal but weak. Length, 12.5; height, 10; diameter, 3.5 mm. (Dall.)

Type in U. S. N. M., No. 212564. Type locality, Station 2859, southwest of Sitka Bay, Alaska, in 1569 fathoms.

Range. Known only from the type locality.

Family LYONSIELLIDÆ.

Genus **LYONSIELLA** M. Sars, 1872.

Shell small, thin; lunule faint or none; ossicle semicylindrical, forked behind; external ligament almost none; right valve edentulous, lunular edge a little produced and thickened; left valve with an elongate obscure thickening of the hinge-margin under the beak.

TYPE. *Lyonsiella abyssicola* Sars.

DISTRIBUTION. North Atlantic and north Pacific in deep water.

Lyonsiella alaskana Dall, 1894.

Proc. U. S. N. M., 17:703; pl. 25, fig. 2.

Shell thin, large for the genus, inequilateral, the anterior end shorter and more vertical, the posterior end more rounded; covered with a yellow, silky epidermis considerably infolded around the margins of the valves; sculpture of fine, distant radiating, elevated threads about half a millimeter apart near the margin; the interspaces crossed by silky lines of growth which are occasionally emphasized as if at resting stages of growth; interior faintly pearly; hinge line edentulous, with a large lithodesma shaped like a flattened shell of Vaginella, with a deep sinus in the wider (posterior) end; beaks moderately prominent, much incurved; lunule larger on the right valve, small heart-shaped, polished; a narrow polished strip on the posterior dorsal edge of the valves may represent an escutcheon. Length of shell, 24; height, 24; diameter, 16 mm. (Dall.)

TYPE in U. S. N. M., No. 123500. Type locality, Station 2859, in 1659 fathoms green ooze, southwest of Sitka.

RANGE. Southwest of Sitka to off Catalina Island, California.

Family CUSPIDARIDÆ

Genus **CUSPIDARIA** Nardo, 1840.

Shell globular, attenuated, and gaping behind; right valve a little the smaller; umbones strengthened internally by a rib on the posterior side; cartilage process spatulate, in each valve (furnished with a movable ossicle, according to Deshayes), with an obsolete tooth in front and a posterior lateral tooth; pallial sinus very shallow.

TYPE. *Tellina cuspidata* Olivi.

DISTRIBUTION. Norway, Britain, Mediterranean, Canaries, Madeira, China, Chili, Moluccas, New Guinea, California, Washington, Oregon.

RANGE IN TIME. Oölite of Britain, Belgium, Italy.

Cuspidaria glacialis G. O. Sars, 1878.

Plate 19, figs. 3, 3a., and Plate 54, figs. 27, 28.

Moll. Reg. Arct. Norv., p. 45; pl. 6, figs. 8a, 8c.

Testa magna, modice convexa, forma oblongo-ovato, antice anguste rotundata, postice sat producta, rostro longo, horizontali, attenuato, apice truncato, margine ventrali medio sat arcuato sub rostro profundius sinuato, dorsali medio angulato, antice convexo, postice recto et leviter declivi, umbonibus parum prominulis non nihil ante medium sitis. Valvulæ solidulæ, albæ, semipellucidæ, subtiliter concentrice striatæ, epidermide cinerea tectæ, processu cartilaginis valde obliquo et parum prominulo, dente laterali v. dextræ elongato, cristæformi. Long., 23. (G. O. Sars.)

TYPE in Museum Christiania. Type locality, Vadso, Norway.

RANGE. Off San Diego, California, 239 fathoms. Also Atlantic.

Cuspidaria subglacialis Dall, 1913.

Plate 21, fig. 1.

Proc. U. S. N. M., **45**:593.

Shell large for the genus, chalky, with a coarse dehiscent olivaceous periostracum; equivalve, nearly equilateral. Beaks nearly in the center of the shell, anterior dorsal margin arcuately descending, anterior end of shell ovately rounded; posterior slope straight, or slightly distally recurved, with a short compressed distally gaping rostrum, terminally subtruncate; base arcuate, somewhat patulous below and behind the beaks, incurved at the beginning of the rostrum; hinge in the left valve with a small obliquely backwardly directed chondrophore; in the right valve there is also a strong lamina parallel with the dorsal margin and separated from it by a groove which receives the edge of the opposite valve in closing; beaks opisthocoelous, inconspicuous. Length, 39; height, 24; diameter, 20 mm. (Dall.)

TYPE in U. S. N. M., No. 265904. Type locality, off California coast.

RANGE. Off the California coast in deep water.

Cuspidaria apodema Dall, 1916.

Proc. U. S. N. M., **52**:407.

Shell small, white, polished, swollen, with a prominent tubular rostrum; inequilateral, the beaks 6 mm. behind the anterior end; the rostrum about 5 mm. long; beaks conspicuous, prosocœlous; the exterior smooth except for incremental lines and wrinkles on the dorsal side of the rostrum; hinge line nearly straight, anterior and rounding imperceptibly into the semi-circular base which is suddenly constricted at the rostrum. Length, 17; height, 10; diameter, 8 mm. (Dall.)

TYPE in U. S. N. M., No. 122602. Type locality, Station 2859, southwest of Sitka Bay, Alaska.

RANGE. Off Sitka, Alaska, to Panama Bay, deep water.

Cuspidaria chilensis Dall, 1889.

Proc. U. S. N. M., **12**:282; pl. 13, fig. 13. *Bull. Mus. Comparative Zool.* **43**:433.

Shell small, thraciæform, smooth, polished, greenish white, inequivalve, nearly equilateral, briefly rostrate; right valve larger, convex, rounded in front; beaks small, prominent, slightly incurved; neither lunule nor escutcheon present; posterior end strongly and suddenly compressed, the compressed portion bounded in front by a depressed ray extending from the beak to the posterior basal margin; posterior end short and rounded, somewhat narrower than the anterior; left valve similar but smaller and less convex, at the posterior hinge line underlying the margin of the right valve; hinge with small roundish projecting chondrophore which extends under the margin of the left valve to which it is united by the resilium; there is no ossiculum; the periostracum is papery and caducous, visible chiefly at the posterior and basal margin. Length, 6; height, 4.5; diameter, 2.7 mm. (Dall.)

Type in U. S. N. M., No. 110582. Type locality, U. S. S. Albatross Station 4654, northwest of Aguja, Peru.

Range. Off Oregon in 277 fathoms to the coast of Chili in 1036 fathoms.

Cuspidaria nana Oldroyd, 1918.

Plate 13, figs. 8, 9.

Nautilus, **32**:28.

Shell small and slender; subventricose, the surface sculptured with numerous fine concentric lines of growth; the umbo anterior to the middle of the shell. Anterior portion obese, posterior slender, prolonged and slightly twisted, not gaping; with a sulcus reaching from the umbos to the rear of the shell. Hinge with no lateral teeth, a small anterior cardinal in the right valve, ligament obsolete, internal resilium strong, set in a prominent, posteriorly inclined resilifer with a strong quadrate lithodesma immediately in front of it. Pallial sinus short, rounded, margins entire. Length, 25; height, 13; diameter, 10 mm. (I. S. Oldroyd.)

Type in Oldroyd Collection, Stanford University, No. 38. Type locality, Monterey, California.

Range. Bolinas to Monterey, California.

SECTION CARDIOMYA A. Adams, 1864

Cuspidaria planetica Dall, 1908.

Bull. Mus. Comp. Zool., **12**:296.

This species has a generally similar aspect to *C. pseustes,* but differs as follows: the rostrum is less constricted at the proximal end, so that

the whole shell is more attenuated backward; there is not so much distinction between the disk and the rostrum; the impressed area, along the dorsal margin, is smaller and is not amphidetic, but ceases to be defined in front of the beaks; the radial major threads appear stronger and less numerous; the chondrophore or fossette is much less conspicuous and is formed by a small pit in the cavity under and almost behind the hinge margin, while in *C. pseustes* it is a comparatively large vertically projecting spoon-shaped process; the general form of *C. planetica* is more elongate and the anterior patulous extension is directed forward rather than obliquely downward; lastly *C. planetica* is uniformly smaller. Length of shell, 24; of posterior part behind the beaks, 13; height, 14; diameter, 11 mm. (Dall.)

TYPE in U. S. N. M., No. 110720. Type locality, U. S. S. Albatross Station 2985, off San Diego, California.

RANGE. Pribilof Islands, Bering Sea, to the Coronado Islands, Lower California.

Cuspidaria beringensis Leche, 1883.

Plate 13, figs. 4, 5.

Vega Exp. Vet. Arb., **3**:438; pl. 32, figs. 1, 2.

Testa valde inflata; umbonibus fere medianis; rostro sursum cavato, margine ventrali arcuato, sub rostro sinuato; in media testa costis radiantibus cum striis alternantibus epidermide fulva. Long., 29; alt., 20; crass., 16.5 mm. (Leche.)

TYPE in Stockholm. Type locality, Bering Sea?

RANGE. Bering Sea to Panama Bay.

Cuspidaria balboæ Dall, 1916.

Proc. U. S. N. M., **52**:407.

Shell small, whitish with a yellowish periostracum; inequilateral, rostrate, somewhat inflated, posterior end shorter, anterior ovately rounded; beaks small, pointed, not elevated; sculpture of anterior half of the disk faintly irregularly concentrically rippled; behind this 12–15 radial, more or less alternated threads extending to the margin from the umbos and increasing in strength backward; behind the last and strongest an excavated concentrically striated space marks the beginning of the rostrum which beyond that has four or five faint radial threads and is abruptly truncate. Length, 8.9; height, 5; diameter, 3.2 mm. (Dall.)

TYPE in U. S. N. M., No. 208650. Type locality, Station 2911, on the edge of Cortez Bank.

RANGE. Known only from the type locality.

Cuspidaria pectinata Carpenter, 1864.

Suppl. Rept. Brit. Assoc., 1864, p. 637. *Proc. Acad. Nat. Sci. Phila.*, 1865, p. 54.

N. t. globosa, albida, subdiaphana; epidermide tenui induta; ventriliter antice producta, postice subito angustato, rostrato; haud insculpto, duabus inter quinque partes totius longitudinis æquante; parte globosa acute costata; costis posticis paullum majoribus, magis distantibus; margines dorsales versus obsoletis; interstitiis latis, quadratis, minutissime concentrice striatis; costis principalibus t. jun. xii.–xv., adulta, aliis crebre intercalantibus, circ. xxx., quarum primi majores: intus, lamina cartilaginea curta, sub umbones celata; dente postico satis elongato, regione adductoris intus claviculato; cicatricibus adductoribus subrotundatis, deorsum sitis; sinu pallii parvo, lato; margine a costis pectinato. Long., .24; lat., .14; alt., .12 of an inch. (Carpenter.)

Shell small, globular, attenuated and gaping behind, thin; umbos anterior; dorsal line straight; anterior extremity evenly rounded; posterior extremity drawn out to a very long, narrow, truncated beak; ventral margin greatly arcuate; surface sculptured by twelve prominent, sharp, radiating ridges; posterior elongation smooth; cartilage-process spatulate, with an obsolete tooth in front. (Arnold.)

Type in British Museum? Type locality, Puget Sound.

Range. Puget Sound to Panama Bay.

Cuspidaria californica Dall, 1886.

Plate 5, fig. 14; Plate. 34, fig. 3.

Bull. Mus. Comp. Zool., **12**:6:296.

Shell differing from *C. pectinata* by its smaller size and proportionately greater length; larger number of ribs (16–20, while *pectinata* averages 12–14); its straighter, longer rostrum with but two strong radiating liræ extending to the lower extreme (*pectinata* has none, or only several fine ones near the body of the valve); its less inflated shape and paler, more delicate epidermis. Color yellowish white; ossicle as usual; buttress present in right valve. Long. of shell, 7; of rostrum, 2.5; alt. of shell, 3.6; diam., 2.75 mm. (Dall.)

Type in U. S. N. M.? Type locality, Catalina Island, California.

Range. Puget Sound to San Diego, California.

Cuspidaria oldroydi Dall, 1924.

Plate 5, fig. 13.

Publ. Puget Sound Biol. Station, **4**:33; pl. 1, fig. 14.

Shell small, short, inflated, chalky white with a pale olivaceous periostracum; beaks prominent, rounded; valves slightly inequilateral, the left

valve slightly smaller than the other, the body of the shell short-oval, the rostrum short, straight, abruptly truncate; sculpture of about fifteen radial threads which extend over the whole valve except the rostrum; incremental lines feeble. Length of anterior end, 5.5; of posterior end, 5; height, 7; diameter, 5 mm. (Dall.)

It is smaller when adult and more coarsely sculptured than young *C. planetica* or *balboæ* of the same size, much larger and more inflated than *C. pectinata, californica* or *beringensis,* all of which belong to the same group, and superficially are very similar except in size. (Dall.)

TYPE in U. S. N. M., No. 333459. Type locality, Puget Sound.

RANGE. Vancouver Island, British Columbia, to Puget Sound.

Genus **MYONERA** Dall and Smith, 1886.

Shell without cardinal or lateral teeth in either valve; with or without a buttress; fossette vertical or posteriorly directed, attached to the hinge by either edge; sculpture radiating or concentric.

TYPE. *Neæra paucistriata* Dall.

DISTRIBUTION. Coast of Oregon, the east coast of North America, and the West Indies.

Myonera tillamookensis Dall, 1916.

Proc. U. S. N. M., **52**:407.

Shell extremely thin, fragile, inflated, beaks nearly central (neglecting the rostrum), whitish, the anterior part of the shell with about twenty strong, rounded, concentric ripples which cease posteriorly at the anterior border of the radial sculpture which includes four strong and about fifteen thread-like radial riblets extending from the beaks to the base, behind which is a short, blunt, concentrically feeble striate, truncate rostrum; base arcuate, hinge-line nearly straight, the right margin slightly overlapping the other. Length, 18; height, 12; diameter, 10 mm. (Dall.)

TYPE in U. S. N. M., No. 107819. Type locality, Station 3346, off Tillamook Bay, Oregon, in 786 fathoms.

RANGE. Known only from type locality.

Genus **LEIOMYA** A. Adams, 1864.

An anterior prominence or cardinal tooth in each valve, anterior and posterior laterals in the right valve, left valve without laterals. Cartilage in a posteriorly directed groove or fossette; surface smooth or concentrically sculptured.

TYPE. *Neæra adunca* Gould.

DISTRIBUTION. West Indies, California.

Subgenus PLECTODON Carpenter, 1864.

Leiomya scabra Carpenter, 1864.

Plate 54, fig. 4.

Suppl. Rep. Brit. Assoc., 1864, p. 638. *Proc. Cal. Acad. Sci.*, 3:207.

Pl. t. ledæ-formi, tenui, subdiaphana, pallida; tota superficie minute pustulosa; marginibus dorsalibus rectis, ad angulum 150°; antice et ventraliter producta, marginibus excurvatis; postice valde rostrata, truncata: intus, margine sub umbones interrupto; plica ex apice oblique ad marginem dorsalem anticum excurrente; dentibus lateralibus laminatis, extantibus, postico longiore; cicatricibus adductoribus parvis, subrotundatis, ad extremitates dentium lateralium sitis; sinu palii lato, haud impresso. Long., .62; lat., .34; alt., .20. (Carpenter.)

Shape of *Theora*: dorsal margins twisted-in spirally inside umbos. Lateral teeth laminated, with internal cartilage hidden, appressed. (Carpenter.)

Described as *Plectodon scaber*, Carpenter.

TYPE. Consisting of two right valves, in California State Collection. Type locality, Catalina Island in 40–60 fathoms.

RANGE. Puget Sound to San Diego, California.

Family VERTICORDIIDÆ.

Genus **VERTICORDIA** Wood, 1844.

Shell suborbicular, with radiating ribs; beaks subspiral; margins denticulated; interior brilliantly pearly; hinge with one prominent cardinal tooth in each valve; adductor scars two, faint; pallial line simple; ligament internal, oblique; epidermis dark brown.

TYPE. *Verticordia cardiiformis* Wood.

DISTRIBUTION. China Sea, Mediterranean, Pacific Coast of the United States, Japan, Antilles.

RANGE IN TIME. From the Miocene.

Verticordia ornata Orbigny, 1846.

Plate 54, figs. 15 to 18.

Moll. Cuba, 2:292; pl. 27, figs. 30–33.

Shell small, suborbicular, compressed, thin; beaks subcentral, subspiral, small, sharp, anterior extremity evenly rounded; posterior dorsal margin evenly arcuate, and joining arcuate ventral margin in an angular extremity; surface with nine prominent, sharp, arcuate, radiating ridges; the first and third interspaces wider than the others; margins sharply denticulate; hinge with one prominent cardinal tooth in each valve; adductor scars two, faint; pallial line simple; ligament internal, oblique; interior pearly. Length, 4; height, 3.5; diameter, 2 mm. (Arnold.)

TYPE locality and disposition of the type not known to the present writer.

RANGE. Catalina Island, California, to Panama Bay. Also Japan and the Antilles.

Family ASTARTIDÆ.

Genus **ASTARTE** Sowerby, 1816.

Shell equivalve, inequilateral, sub-ovate, or orbicular, or sub-trigonal, generally sub-compressed; concentrically wrinkled, covered with a thick epidermis, closed. Muscular impressions two, large, rather kidney-shaped. Impression of the mantle entire. Hinge tridentate in each valve. Ligament external, with dorsal area and lunule excavated. (Reeve.)

TYPE. *Pectunculus sulcatus* Da Costa.

DISTRIBUTION. Bering Strait, Wellington Channel, Kara Sea, Ochotsk, Puget Sound, Oregon, Norway, Britain, Canaries, Ægean.

RANGE IN TIME. From the Carboniferous in North and South America, Thibet and Europe.

Astarte polaris Dall, 1903.

Pros. U. S. N. M., **26**:939; pl. 63, fig. 5.

Shell rounded-trigonal, moderately thick, bluish white, covered with a slightly polished light-brown periostracum; valves moderately convex, with the umbos high, somewhat prosogyrate, over a well-impressed lanceolate lunule, which is unequally divided, the right valve bearing the larger share; escutcheon narrower and longer than the lunule, impressed, smooth; sculpture of forty or more small, narrow, regular, concentric riblets separated by about equal interspaces; in the adult the posterior slope and ventral third of the disk have the riblets replaced by somewhat uneven concentric striation; interior smooth, the inner margins finely evenly crenate; hinge rather solid, the middle cardinal in each valve grooved or bifid. Length, 28; height, 25; diameter, 15 mm. (Dall.)

TYPE in U. S. N. M., No. 106859. Type locality, near Shumagin Islands, Alaska.

RANGE. Aleutian and Shumagin Islands, Alaska, and Circumboreal.

Astarte compacta Carpenter, 1864

Plate 2, fig 4.

Suppl. Rep. Brit. Assoc., 1864, p. 642. *Proc. Acad. Nat. Sci. Phila.*, 1865, p. 57. *Proc. U. S. N. M.*, **26**:944; pl. 63, fig. 8.

A. t. "A *compressæ*" simili, sed compacta, minus transversa; liris concentricis expressis, paucioribus, marginem posticam versus obsoletis;

umbonibus valde prominentibus, acutioribus; marginibus dorsalibus rectus, ad angulum 100°; lunula minus impressa, longiore; area ligamentali minus angulata; dente laterali antico valva dextra extante. Long., .56; lat., .33; div., .21. (Carpenter.)

Like *compressa,* but closer; dorsal margins straight, at right angles. (Carpenter.)

TYPE in U. S. N. M.? Type locality, Puget Sound.

RANGE. Forrester Island, Alaska, to Puget Sound.

Astarte willetti Dall, 1917.

Nautilus, 31:1:10.

Shell small, of a yellowish-brown externally, milk-white internally; the external sculpture of small concentric waves is more regular and constant than in *compacta;* the form is more oval and the beaks more anterior than in that species, and *willetti* appears to attain a larger size. In *compacta* the lunule is relatively narrower and longer than in the new species. In the interior the hinge of the latter is better developed than in *compacta,* all three teeth being usually represented, while in *compacta* the posterior and particularly the anterior cardinal is frequently obsolete or absent. The shell substance of *A. compacta* is more translucent and bluish, and the crenulations of the valve margin when present are distinctly smaller and less conspicuous than in *willetti.* Length, 16; height, 14; diameter, 9 mm. (Dall.)

TYPE in U. S. N. M., No. 216364. Type locality, Forrester Island, Alaska.

RANGE. Known only from the type locality.

SECTION TRIDONTA Schumacher

Astarte rollandi Bernardi, 1858.

Plate 53, fig. 2.

Jour. de Conch., 7:386; pl. 13, fig. 4.

Suborbicular, nearly smooth, large and heavy, with dark chestnut-brown periostracum, which in the adults is dehiscent on drying. This species takes the place in the western fauna occupied by *A. castanea* on the eastern coast. (Dall.)

TYPE locality and disposition of the type not known to the present writer.

RANGE. Pribilof and Aleutian Islands to Prince William Sound, Alaska. Also Kamchatka.

Astarte rollandi loxia Dall, 1903.

Proc. U. S. N. M., **26**:943.

This is a pale oblique variety, which is found on oceanic islets. (Dall.)

TYPE in U. S. N. M. Type locality, Chika, the Semidis and Middleton Islets.

RANGE. Semidi Islands, Alaska.

Astarte arctica Gray, 1824.

App. Parry's Voy., p. 243. *Sars, Moll. Reg. Arct. Norv.*, pl. 5, fig. 8.

Shell elliptical-suborbicular, sub-compressed, rather irregularly ridged near the umbos and at the middle, smooth toward the margin; anterior side very short; posterior side obscurely angular, truncated; dorsal margin sloped; ventral margin rounded, smooth within. (Conch. Iconica.)

TYPE in British Museum? Type locality, northern seas.

RANGE. Arctic and Bering Sea and the Aleutian Islands. Circumboreal.

Astarte borealis Schumacher, 1817.

Essai, **47**:pl. 17, fig. 1.

Shell compressed, with the beaks concentrically ribbed; the rest of the disk more or less smooth.

This is the *semisculata* of Leach, 1819; the *veneriformis* Wood, 1828. (Dall.)

TYPE locality and disposition of the type not known to the present writer.

RANGE. Polar and Bering Seas to Prince William Sound, Alaska. Also North Japan.

Astarte alaskensis Dall, 1903.

Plate 13, fig. 20.

Proc. U. S. N. M., **26**:944; pl. 63, fig. 2.

Much resembling *A. elliptica* of the eastern coast, but shorter, heavier, and more triangular. The periostracum is black or dark brown and dehiscent when dry. It has usually been identified as *undata* but is never crenulated. (Dall.)

TYPE in U. S. N. M. Type locality, southern part of Bering Sea.

RANGE. Herschell Island, Arctic Coast; Southern Bering Sea, the Aleutians and south to Puget Sound.

Astarte fabula Reeve, 1855.

Plate 19, figs. 4, 4a.

Last of the Arctic Voy., **2**:398; pl. 33, fig. 5.

Testa transverse ovata, compressa, versus umbones sub-trigona, laterabus utrinque sub-concavis, deinde rotundatis, circa umbones regulariter sulcata, deinde lævigata aut striis incrementi notata, areis lateralibus parum excavatis; fulvescente-castanea. (Reeve.)

A thin elongate-ovate, inflated species, with the posterior end slightly longer, the umbonal region peculiarly, squarely, concentrically sulcate, and the basal portion striated. The color is usually dark brown. It was described by Sowerby in 1874, as *A. semilirata*. (Dall.)

TYPE in British Museum? Type locality, Arctic.

RANGE. Arctic Sea, Bering Sea, Nunivak Island. Circumboreal.

Astarte bennettii Dall, 1903.

Proc. U. S. N. M., **26**:946; pl. 63, fig. 6.

Shell small, thin, sub-cuneate, sub-compressed, with a polished olivaceous periostracum; posterior end shorter, bluntly rounded; anterior end longer, more sloping and direct dorsally, rounded; base nearly straight in the young; surface finely concentrically striate, or nearly smooth, the striæ more apparent on the beaks; lunule narrow, lanceolate, impressed, escutcheon similar, a little longer than the lunule; beaks high, slightly prosogyrate; hinge delicate, the large cardinals slightly grooved above, the laterals apparent; pallial line rather near the margin, which is not crenulate. Length, 11.5; height, 10.5; diameter, 5 mm. (Dall.)

TYPE in U. S. N. M., No. 83221. Type locality, northern part of Bering Sea.

RANGE. Polar Sea at Bennett Island, and south in Bering Sea to Nunivak Island.

Astarte vernicosa Dall, 1903.

Proc. U. S. N. M., **26**:948; pl. 63, fig. 1.

Shell small, sub-compressed, sub-trigonal, sub-equilateral, covered with a brilliantly polished olivaceous brown periostracum; beaks rather high, slightly prosogyrate, the lunule narrow, lanceolate, impressed, the escutcheon similar but longer; base arcuate, anterior end rounded, posterior end slightly more produced; hinge delicate, inner margins smooth, hinge teeth much as in *A. bennettii*. Length, 17; height, 15; diameter, 6.7 mm. (Dall.)

TYPE in U. S. N. M., No. 109276. Type locality, off Icy Cape, Arctic.

RANGE. Arctic and Bering Seas to the Attu-Atka Islands in the Aleutian Chain.

Astarte globosa Moller, 1842.

Plate 19, figs. 5, 5a.

Index Moll. Gronl., p. 20. Reeve, *Last of the Arctic Voy.*, **3**:398; pl. 33, fig. 6.

Testa sub-trigona, ventricosa, transversim minute sulcate, luteo-fusca; parte anteriore prominente, rotundata; parte posteriore obtusa, truncata Diam., 5‴. (Moller.)

Small, blunt, ventricose, yellow-brown, the anterior end longer, rounded, the posterior end sub-truncate, the surface closely, finely, concentrically sulcate all over. (Dall.)

TYPE locality and disposition of the type not known to the present writer.

RANGE. Arctic Coast, Greenland.

SECTION RICTOCYMA Dall, 1872.

Astarte esquimalti Baird, 1863.

Plate 13, fig. 19.

Proc. Zool. Soc., p. 70. *Proc. U. S. N. M.*, **26**; pl. 63, figs. 11, 12.

C. testa parva, cordato-trigona, crassiuscula, olivacea, transversim undato-plicata, antice producto-rotundata, postice subtruncata, margine ventrali rotundata, umbonibus, lunule longe caudata. Long. rather more than ⅓ inch; lat., nearly ½ inch. (Baird.)

Recognizable by its irregular sculpture. (Dall.)

TYPE in British Museum. Type locality, Esquimalt Harbor, Vancouver Island, British Columbia.

RANGE. Aleutian Islands to Puget Sound.

Genus **BERNARDINA** Dall, 1910.

Shell small, of the general form of *Rochefortia,* concentrically sculptured externally, with a conspicuous prodissoconch, which is elevated in the center and at the margins and between these points somewhat excavated; pallial line entire; hinge with the posterior dorsal margin of the right valve fitting into a shallow groove in the margin of the opposite valve; anteriorly with a strong left lateral fitting between two prominent flexuous right anterior laterals; two right and three left cardinals with the resilium posterior to them all. (Dall.)

TYPE. *Bernardina bakeri* Dall, 1910.

DISTRIBUTION. California.

Bernardina bakeri Dall, 1910.

Plate 15, figs. 7, 8.

Proc. Biol. Soc. Wash., **23**:171.

Shell small, short-ovate, white, with sculpture of fine regular concentric grooves with wider interspaces; moderately compressed; umbos moder-

ately elevated, capped by the prodissoconch; internal margins smooth, the posterior adductor scar larger; hinge as described under the genus, with no external ligament; texture of shell porcelaneous and rather solid. Length, 2.3; height, 1.6; diameter, 1 mm. (Dall.)

TYPE in U. S. N. M., No. 221199. Type locality, near the south Coronado Island, in 3 fathoms.

RANGE. Coronado Islands, Lower California.

Family CRASSATELLITIDÆ.

Genus **CRASSATELLITES** Kruger, 1823.

Shell solid, inequilateral, slightly inequivalve, usually subtrigonal, the posterior end longer; valves closed, the ligament and resilium adjacent and internal; hinge of three cardinals in the right valve, of which the posterior is more or less effaced by the resilium, and two in the left valve; the anterior edge of the right and the posterior edge of the left hinge-margin grooved to receive the edge of the opposite valve, which is beveled to serve as a lateral lamina; sculpture chiefly concentric and often obsolete except near the umbos. (Dall.)

TYPE. *Crassatellites sinuata* Kruger.

DISTRIBUTION. West Coast of North America.

RANGE IN TIME. From the Miocene, North America.

Crassatellites fluctuatus Carpenter, 1864.

Suppl. Rep. Brit. Assoc., 1864. p. 642. *Proc. Cal. Acad. Sci.*, 3 :209.

A. t. valde planata, ovoidea, costis concentricis valde distantibus, angustis, undulatis, ornata; marg. dors. post. subrecto, ant. concavo, lunula longa, parum impressa; ventr. satis rotundato; ant. valde rotundato; post. subquadrato; intus, v, dextr., lamina cardinali planata; dent. card. i. inter fossas ant. parvam, post. triangularem, extante; dent. lat. ant. acutiore, satis elongato, post. nullo; cicatr. adduct, ovalibus, postica callo definita; margine haud crenato; sulco ligamenti externi elongato. Long., .33; lat., .26. (Carpenter.)

Described as *Astarte fluctuata.*

TYPE in California State Collection, No. 1060. Type locality, Catalina Island, California.

RANGE. Santa Barbara Island to San Pedro, California.

Genus **CRASSINELLA** Bayle.

Shell obliquely lengthened, subquadrangular.

TYPE. *Astarte obliqua* Deshayes.

DISTRIBUTION. Pacific, California.

RANGE IN TIME. Jurassic, Pleistocene, San Pedro, and San Diego, California.

Crassinella branneri Arnold, 1903.

Pal. San Pedro, p. 127; pl. 18, fig. 12.

Shell small, sub-trigonal, equivalve, inequilateral, convex, thick; umbo small, sharp; anterior dorsal margin straight to anterior extremity, where it meets the arcuate ventral margin in an angle; posterior dorsal margin evenly arcuate, sloping down to rounded, posterior extremity; surface sculptured with numerous angular, concentric undulations or ridges; lunule long, narrow, extending to anterior extremity, and circumscribed by a narrow, angular ridge; ligament external, not prominent; two prominent cardinal teeth in right valve; one in left; no laterals; pallial line entire, running from the middle of adductor scars; adductor scars subequal, small. Length, 10; height, 8.9; diameter, 5 mm. (Arnold.)

TYPE in U. S. N. M. Type locality, the upper San Pedro series of San Pedro, California. Fossil.

RANGE. San Diego, California to Panama. In the Pleistocene at San Pedro and San Diego, California.

Family CARDITIDÆ.

Genus **CARDITA** (Bruguière) Lamarck, 1799.

Shell oblong, radiately ribbed; ligament external; margins toothed; hinge-teeth 1.2, and an elongate, posterior tooth; pallial line simple; anterior pedal scar close to adductor. (Tryon, Structural and Systematic Conch.)

TYPE. *Chama calyculata* Linnæus.

DISTRIBUTION. Universal.

RANGE IN TIME. Lower Silurian to Pleistocene. United States, Europe, New South Wales, Tasmania.

SECTION CARDITAMERA Conrad, 1838.

Cardita subquadrata Carpenter, 1865.

Suppl. Rep. Brit. Assoc., 1864, p. 642; *Ann. Mag. Nat. Hist.,* (3) **15**:178.

L. testa extus Carditæ variegatæ jun. simili; pallida, castaneo tincta; sub-quadrata, antice truncata, sub-regulariter ventricosa, dorsaliter tumida; costis radiantibus circ. xiv.-xvi., tumidis, nodosis, diagonalibus majoribus; interstitiis plus minusve insulptis; intus, valva dextra dente cardinali triangulari, inter duas fossas sito, haud elongato; dent. lat. a cardine separatis, ant. extante, post. obsoleto, calloso; v. sinistrali dent. card. ii. angustis, subæqualibus, radiantibus; lat. ant. et post. extantibus; cicatr. adduct. sub-rotundatis. Long., .37; lat., .23; alt., .34. (Carpenter.)

Shell small, transverse, sub-rectangular, inequilateral, ventricose, thick; beaks sub-anterior, not prominent; dorsal posterior margin long, straight; anterior portion abruptly truncated just in front of beaks; surface sculptured with heavy, squamose, rounded, radiating ridges; interior margin coarsely crenulated; hinge with two lateral diverging teeth in each valve, the posterior teeth being in each case much elongated, the anterior short and pointed. (Arnold.)

TYPE in the California State Collection, No. 403. Type locality, Santa Barbara, California.

RANGE. Queen Charlotte Islands, British Columbia, to Todos Santos Bay, Lower California. In the Pleistocene at Santa Barbara and San Pedro, California.

Genus **VENERICARDIA** Lamarck, 1801.

Shell rounded-trigonal, strongly radially ribbed, the ribs frequently beaded, especially when young, the lunule minute and deep, the escutcheon linear, the internal margins crenate, the hinge with two transversely striated cardinals in the left and three in the right valve, the laterals absent or obsolete, a sublunular pustule sometimes present in the left valve. (Dall.)

TYPE. *Venericardia imbricata* Lamarck.

DISTRIBUTION. Chiefly in tropical seas, on rocky bottoms and in shallow water. West Indies, United States, West Africa, Mediterranean, Red Sea, India, China, Australia, New Zealand.

RANGE IN TIME. Eocene to Pleistocene.

SECTION CYCLOCARDIA Conrad, 1838.

Venericardia barbarensis Stearns, 1890.

Plate 43, figs. 9, 11.

Proc. U. S. N. M., 13:214; pl. 16, figs. 4, 3.

Shell rounded, inequilateral, variable in outline, more or less oblique, moderately convex. Beaks small, slightly elevated and turned forward. Surface ornamented with nineteen to twenty radiating ribs usually somewhat granulous, and generally obscure on the extreme anterior and posterior margins of the valves. Epidermis a dingy yellowish-brown, thicker toward the ventral margin and sides of the valves thin and commonly eroded at or toward the umbos. Lunule small, slightly sunken, faintly defined. Hinge line small, not thick; hinge composed of, in the left valve, a single strong cardinal sloping posteriorly and a smaller tooth often obscure, slanting anteriorly; a third tooth-like process is generally present, situated under and apparently a projection of the edge of the lunule. This

latter varies much in prominence in different specimens, and is often but barely perceptible. The hinge in the right valve is characterized by a single strong cardinal tooth with a slanting, somewhat sinuous groove above, and a slight notch and tooth-like point below the upper part of the lunule; this latter character is frequently inconspicuous and feeble. The valves are rather thin and somewhat translucent, bluish-white on the inside and showing the ribs when held up to the light. Length, 15; height, 15; diameter, 11 mm. (Stearns.)

TYPE in U. S. N. M., No. 104045. Type locality, Station 2840, off Santa Barbara, California.

RANGE. Santa Barbara Channel to San Diego, California, in deep water.

Venericardia gouldii Dall, 1902.

Proc. Acad. Nat. Sci. Phila., p. 714. *Proc. U. S. N. M.*, **26**; pl. 63, fig. 3.

Shell thin, ovate, inequilateral, moderately inflated with about 23 low, broad, rounded ribs with much narrower shallow interspaces, the anterior ribs slightly crenulated by fine transverse ridges, the ribs behind the umbos nearly smooth, covered by a yellowish-brown periostracum; lunule very small and impressed, escutcheon linear; inner margin crenulated below, hinge plate delicate, narrow, without marked laterals. Height, 13.5; length, 16.5; diameter, 8 mm. (Dall.)

TYPE in U. S. N. M., No. 109270. Type locality, off San Diego, California.

RANGE. Known only from the type locality.

Venericardia stearnsii Dall, 1902.

Proc. Acad. Nat. Sci. Phila., p. 709. *Proc. U. S. N. M.*, **13**; pl. 16, figs. 5, 6.

Shell short, plump, strong, with very high prosogyrate beaks and about 19 strong, rudely nodulous radial ribs with narrower interspaces and a dark-brown pilose periostracum. It has been figured as mentioned under *V. ventricosa,* having been erroneously taken as the type of that species by the writer. It is a much shorter and higher shell with a very small deeply impressed lunule and strong hinge, in which the lunular pustule in the left valve is conspicuous. (Dall.)

TYPE in U. S. N. M. Type locality, Puget Sound.

RANGE. Known only from the type locality.

Venericardia paucicostata Krause, 1885.

Plate 13, fig. 13.

Arch. f. Naturg., **51**:1:30; pl. 3, fig. 3.

Rippen 12–13, breit und flach, durch die Anwachslinien unregelmässig wellig quergestreift, ohne die regelmässige Furchen in der Nähe

der Wirbel. Die Epidermis ist glatt, nicht filzig, die Langslinien auf den Rippen sind nur ganz schwach angedeutet. Die Wirbel liegen im ersten Drittel; sie sind stark zerfressen. Der Schlossrand ist sehr dick und die Zähne sind kräftig. Das grösste Exemplar zeigt die Masse. Long., .31; alt., .26; crass., .14 mm. (Krause.)

TYPE in Stuttgart Royal Cabinet. Type locality, Emmahafen.

RANGE. Arctic Sea to Juan de Fuca Strait.

Venericardia nodulosa Dall, 1919.

Proc. Biol. Soc. Wash., **32**:249.

Shell small, rotund, inflated, solid, creamy white, with 13–15 radiating, strong, transversely nodulous ribs; the surface is also concentrically finely lineated in the interspaces which are narrower than the ribs; the beaks are prominent, there is a lanceolate small lunule in front of them, but the escutcheon is linear or absent; the right valve has a large central and a small lamellar cardinal tooth on each side of it; there are two rather weak left cardinals; the interior margins are conspicuously fluted in harmony with the external sculpture. Length, 11; height, 10; diameter, 6 mm. (Dall.)

TYPE in U. S. N. M., No. 211887. Type locality, U. S. Fisheries Commission, Station 2901, off Santa Rosa Island, California.

RANGE. Santa Barbara, California, to the Coronado Islands, Lower California.

Venericardia crassidens Broderip and Sowerby, 1829.

Zool. Journ., **4**:365. *Proc. U. S. N. M.*, **26**:949; pl. 43, fig. 9.

A. testa suborbiculari, crassa; obsolete radiatim sulcata; antice brevissima; umbonibus antice productis; marginibus internis crenatis; cardine lato, dente centrali in valva altera maximo. Long., $^{16}/_{10}$; lat., $^{17}/_{20}$; alt., $^{113}/_{20}$ poll. (Broderip and Sowerby.)

A single specimen of this fine species was obtained off Icy Cape by Lieutenant Belcher. Its epidermis is thick and dark coloured, but is much eroded around the umbos. The shell is of a dirty white colour, except the center within, where it is tinged with dull reddish purple. The edges of the very broad tooth in the hinge of the right valve are irregularly sculptured. The internal marginal crenations are very wide, and have almost the appearance of low embrasures. (Broderip and Sowerby.)

TYPE in Mr. Bland's collection. Type locality, Arctic Ocean.

RANGE. Arctic and Bering Seas and eastward; Kodiak Island, Alaska.

Venericardia ventricosa Gould, 1850.

Proc. Boston Soc. Nat. Hist., 3:276. *Rept. U. S. Expl. Exp.*, p. 417; fig. 532.

Shell small, solid, very slightly oblique; beaks tumid, elevated, nearly central, slightly curved, eroded; valves tumid, with about 18 or 20 rounded, well-defined radiating ribs, which are crossed by numerous inconspicuous, nodular, concentric bars, most distinct about the umbos, covered with a rusty-brown, velvety epidermis, the pile set in radiating ranges, especially in the intercostal spaces. Hinge of the right valve with a strong, elevated, oblique, triangular tooth, defined by deep furrows each side, its apex detached from the margin of the shell, acute; marginal crenulations deep, well defined. Length, ¾; height, ⅝; diameter, ½ inch. (Gould.)

TYPE in Boston Soc. Nat. History? Type locality, Puget Sound.

RANGE. Belkoffski Bay, Alaska, to the Coronado Islands and Cortez Bank.

Venericardia crebricostata Krause, 1885.

Plate 13, fig. 12.

Arch. f. Naturg., 51:30; pl. 3, fig. 4.

Die Zahl der Rippen beträgt 22–25; der Schlossrand ist dick, die Wirbel liegen central und sind nicht zerfressen, in der Nähe der Wirbel sind die Rippen durch concentrische Furchen deutlicher und regelmässiger crenulirt als bei den vorigen. Die gitterartige Sculptur der Rippen ist wie bei der vorigen. Die grössere Schale zeigt folgende Masse, als bei der vorigen. Long., 24; alt., 22½; crass; 6½ mm. (Krause.)

TYPE in Stuttgart Royal Cabinet. Type locality, St. Paul Island, Alaska.

RANGE. Point Barrow, Alaska, to Monterey.

Venericardia monilicosta Gabb, 1861.

Proc. Acad. Nat. Sci. Phila., p. 371.

Shell nearly circular; beaks small, submedian, cardinal border straight or faintly arcuate. Surface marked by from fourteen to seventeen large rounded ribs, strongly moniliform; interspaces narrow, acute. Posterior muscular impression largest. Pallial line broad and distinct but not impressed. Internal margin coarsely crenulate, one large square tooth corresponding with each interspace between the ribs; extreme edge undulated. Hinge robust. Length, 1.9 in.; width, 2 in.; depth of single valve, .05 in. (Gabb.)

This was described as *Cardita monilicosta,* and may not be found in the recent.

TYPE locality, Tertiary of Santa Barbara, California.

RANGE. Recent (?) only from type locality. Fossil. Pleistocene.

Venericardia incisa Dall, 1902.

Proc. Acad. Nat. Sci. Phila., p. 714; *Proc. U. S. N. M.*, **26**; pl. 63, fig. 4.

Shell small, polished, with a smooth, lovely olive-green periostracum; over eighteen to twenty flat radial ribs separated by linear incised sulci and crossed by similar concentric sulci, about as distant as the ribs are wide, lunule almost obsolete, no escutcheon visible; beaks moderately high, somewhat anterior; hinge delicate, internal margins strongly crenate; siphonal end of the valves usually overgrown by a commensal minute hydroid. Height, 10; length, 9.5; diameter, 5.3 mm. (Dall.)

TYPE in U. S. N. M., No. 109267. Type locality, Unalaska.

RANGE. Unalaska to Semidi Islands, Alaska.

Subgenus MIODONTISCUS Dall, 1903.

Venericardia prolongata Carpenter, 1864.

Plate 2, figs. 5, 6.

Suppl. Rep. Brit. Assoc., pp. 236 and 642.

M. testa parva, solida, tumida, compacta, albida; ventraliter antice valde prolongata, excurvata; lunula longa, rectiore, haud impressa; umbonibus antice inflectis, obtusis, valde prominentibus; margine dorsali postico parum excurvato; costis radiantibus; x.–xii. latis, obtusis, marginem attingentibus, parum expressis, dorsaliter obsoletis, a liris incrementi concentricis, plus minusve distantibus, expressis, hic et illic interruptis; intus, margine a costis plus minusve obsoletim crenulato; cardine dentibus v. dextr., uno postico, inter duas fossas, elongato, et lat. ant. lunulari; v. sinistr., dent. ant. triangulari, post. valde elongato, lat. ant. minimo, obsoleto; cicatr. add. subrotundatis, ventraliter sitis. (Carpenter.)

Shell small, high, the anterior end longer, with narrow umbos and radial ribbing, a well-marked lunule and escutcheon present, the hinge with the right cardinal absent and a posterior right and anterior left lateral feebly developed. Length, 5; height, 5; diameter, 3 mm.

TYPE in U. S. N. M. Type locality, near Neah Bay, Washington.

RANGE. Middleton Island, Alaska, to San Diego, California.

Venericardia meridionalis Dall, 1916.

Proc. U. S. N. M., **52**:408.

Shell small, solid, white, with nine or ten strong rounded adjacent radial ribs cut by about as many concentric incised lines, the segments of the ribs more or less swollen; beaks small, erect, no visible lunule, or escutcheon; teeth strong; inner basal margin coarsely crenulate. Length, 4; height, 4; diameter, 2 mm. (Dall.)

TYPE in U. S. N. M., No. 208948. Type locality, Station 4300, off Point Loma, California, in 78 fathoms.

RANGE. Known only from type locality.

Genus **CALYPTOGENA** Dall, 1891.

Shell smooth or faintly concentrically striated, with a well-marked escutcheon but no lunule; the inner margins smooth; dental formula $\frac{\text{L.}\overbrace{1010.10}}{\text{R.}\underbrace{0101.01}}$, including an anterior lateral in each valve; the teeth become more or less obsolete in the adult, and in young retain the link between laterals and cardinals, which in most bivalves is lost at a very early age. (Dall.)

TYPE. *Calyptogena pacifica* Dall.

DISTRIBUTION. Pacific, of North America, Fossil, Pliocene Pacific North America.

Calyptogena pacifica Dall, 1891.

Proc. U. S. N. M., **14**:190 and **17**; pl. 25, figs. 4, 5.

Shell equivalve, elongate, ovate, white with a thick greenish epidermis; sculpture of incremental lines; form much like Petricola carditoides Conrad, the beaks not prominent, the ligament stout, the escutcheon long, narrow, and deep. Length of adult shell, 48; height, 27; diameter, 18 mm. The beaks are 14 millimetres behind the anterior end. (Dall.)

TYPE in U. S. N. M. Type locality, U. S. Steamer Albatross, Station 3077, off Dixon Entrance, Alaska, in 322 fathoms.

RANGE. Clarence Strait, Alaska, to Santa Barbara Channel, California.

Calyptogena elongata Dall, 1916.

Plate 22, fig. 6.

Proc. U. S. N. M., **52**:408.

Shell resembling a *Tagelus* in form, elongate compressed, white under a yellowish periostracum, rounded at both ends, base nearly straight; anterior dorsal slope short, beaks low, small, pointed, about 10 mm. from the anterior end of the valves, posterior slope long, gently arcuate; surface devoid of any sculpture except rather conspicuous incremental lines; ligament strong; interior porcellanous white, pallial line entire; hinge teeth small, normal. Length, 44; height, 17.5; diameter, 10 mm. (Dall.)

TYPE in U. S. N. M., No. 110774. Type locality, off Point Loma, California, in 275 fathoms, at Station 4432.

RANGE. Santa Barbara Islands to San Diego, California.

Genus **MILNERIA** Dall, 1881.

Shell with two left and three right cardinals, the posterior left lateral, posterior and anterior right cardinals minute and hardly recognizable except in very well-developed specimens, in which the formula is $\frac{R.1.01010}{L.0.10101}$. The female has a dome-like indentation arising from the ventral margin of the valves, which is closed only by an extension of the mantle edge and therefore not included within the shut valves. The animal is minute, byssiferous, and a nestler on flat surfaces, like the backs of the shells of Haliotis. (Dall.)

TYPE. *Ceropsis minuta* Dall.

DISTRIBUTION. California.

Milneria minima Dall, 1871.

Plate 54, figs. 29 to 31.

Amer. Jour. Conch., **7**:152; pl. 16, figs. 5, 6.

Shell minute, trapeziform, white, with a thin brownish epidermis. Umbos prominent, nearly terminal. Anterior margin rather strongly angulated; basal margin straight, or a little concave; lower posterior extremity angulated; upper posterior angle rounded off; posterior margin rather oblique. Hinge line smooth, rather broad. Ligament conspicuous, moderately long. A rounded carina passes from the umbo to the lower posterior angle, above which are from two to five radiating ribs. General sculpture of sharp elevated lines of growth, which become vaulted scales on the ribs. Margin lightly crenulated. Interior polished; muscular and pallial impressions indistinct. Long., .14; lat., .08; alt., .075 inch. (Dall.)

TYPE in U. S. N. M. Type locality, Monterey, California.

RANGE. Monterey, California, to Rosario Bay, Lower California.

Milneria kelseyi Dall, 1916.

Plate 54, figs. 19 to 23.

Proc. U. S. N. M., **52**:408; **8**: pl. 25, figs. 4, 7.

This species has been confused from the beginning with *M. minima* Dall and is best diagnosed comparatively. The latter has the radial sculpture, especially the four strong ribs of the posterior part, coarsely and conspicuously imbricated, with no very marked keel from the umbo to the posterior basal angle. The shell in a general way is in all respects less angular. *M. kelseyi* has a conspicuous ridge extending from the umbo to the posterior basal angle; the imbricated ribs are less conspicuous, the scales smaller and less prominent, the anterior end more attenuated, the shell wider and more depressed, and is apparently larger when mature. Length, 11; height, 3; diameter, 4.5 mm. (Dall.)

TYPE in U. S. N. M., No. 253037. Type locality, Central California, on *Haliotis* shells.

RANGE. Monterey, California, to Point Abreojos, Lower California.

Family CHAMIDÆ

Genus **CHAMA** Linnæus, 1758.

Shell orbicular, ovate or oblong-ovate, irregular, inequivalve, profusely ornamented with spines, scales or lamellæ; lower valve more or less deeply convex, upper valve flatter; umbones unequal distant, involuted sometimes to the right, sometimes to the left in the same species. Hinge composed of a single thick oblique slightly crenated tooth inserted in a correspondingly grooved pit in the opposite valve. Muscular impressions two, lateral large. Ligament external, divaricate behind the umbones. (Conch. Iconica.)

TYPE. *Chama lazara* Linnæus.

DISTRIBUTION. Tropical seas, especially amongst coral reefs.

RANGE IN TIME. Cretaceous, Pleistocene.

Chama pellucida Sowerby, 1834.

Proc. Zool. Soc., p. 150. Keep, *West Coast Shells;* fig. 155.

Chama testa alba roseo seu rubro fucata vel strigata, lamellis frequentibus, frondibus elongatis pellucidis; intus alba, limbo crenulato. (Sowerby.)

Shell orbicular circuitously triangular, affixed by the side, both valves very beautifully concentrically lamellated, lamellæ small, somewhat erect, margins of the valves very minutely crenulated; whitish, peculiarly transparent, rayed from the umbones with scarlet rose. Length, 50; height, 52; diameter, 38 mm. (Conch. Iconica.)

TYPE in Cuming Coll., British Museum. Type locality, Iquique, Peru.

RANGE. Oregon to Chile and the Galápagos Islands. In the Pleistocene at San Pedro and the Pliocene in Ventura County, California.

Chama frondosa Broderip, 1834.

Proc. Zool. Soc., p. 148. *Trans. Zool. Soc.*, **5**; pl. 38, figs. **1, 2.**

Chama testa sublobata, lamellosa, lamellis sinuosis frondosis, longitudinaliter plicatis et in utraque valva cardinem versus biseriatis, maximis; intus albida, limbo purpurascente, crenulato. (Broderip.)

Shell ovate or somewhat squarely ovate, more or less lobed, very closely irregularly lamellose, lamellæ finely radiately plaited, sinuous, in two rows, one posterior, the other medial, radiating from the umbone, the lamellæ are much larger and very beautifully frondose; interiorly the

edges of the valves are very minutely crenulated and wrinkled with striæ; bright saffron yellow, stained here and there with purple, interior bluish white, stained with rich crimson purple toward the edge. (Conch. Iconica.)

TYPE in Cuming Coll., British Museum. Type locality, Island La Plata, West Colombia.

RANGE. San Diego, California, to Peru.

Chama buddiana C. B. Adams, 1850.

Panama Shells, p. 253.

Shell orbicular or subtriangular; exterior surface and inner margins purplish red, with the spines pure white; surface uneven, with interrupted radiating striæ; upper valve ornamented with a few radiating series of short thick triangular vaulted spines; lower valve attached by about two-thirds to three-quarters of its surface, the rest being like the upper valve, but with the dentiform spines smaller; within both valves are deeply and finely crenulated at the junction of the white surface and red margin; beaks submarginal. Easily distinguished from *C. pacifica* and *C. broderipii* by the small thick dentiform triangular white spines. Diameter about 3 inches. (C. B. Adams.)

TYPE in Amherst College Collection. Type locality, Guaymas, Mexico.

RANGE. Monterey, California, to Panama.

Chama exogyra Conrad, 1837.

Jour. Acad. Nat. Sci., Phila., 7:256. *Conch. Iconica, Chama,* pl. 7; fig. 38.

Shell obliquely affixed, sinistral; lamellæ of the valves prominent, deeply lobed; color white, tinged with red and green; within white, margin entire; posterior muscular impression profoundly elongated. (Conrad.)

TYPE in Acad. Nat. Sci. Phila.? Type locality near Santa Barbara, California.

RANGE. Oregon to Panama. In the Pleistocene at Santa Barbara, San Pedro, and on San Nicolas Island, California.

Family THYASIRIDÆ

Genus **THYASIRA** (Leach) Lamarck, 1818.

Shell globular, posterior side furrowed or angulated; umbones much recurved; lunule short or indistinct; ligament usually and to a certain extent external, placed in a groove on the hinge line, and outside the hinge plate; teeth altogether wanting.

The largest known species is the *Thyasira bisecta* of Conrad from the Miocene of the Pacific Coast, which has survived in the deeper water of Puget Sound until the present day. (Dall.)

TYPE. *Tellina flexuosa* Montagu.

Thyasira bisecta Conrad, 1849.

Plate 10, fig. 1.

Rep. U. S. Exp., **10**:724; pl. 17, fig. 10.

Shell large, subquadrate, convex, of medium thickness, equivalve, inequilateral; beaks terminal, anterior; anterior end abruptly and angularly truncated; posterior dorsal margin arcuate, sloping down toward posterior extremity; surface marked only by lines of growth except near the posterior part. Where the peculiar truncation takes place, the surface suddenly descending at right angles to the curve of the shell, for a short distance, and then resuming its former direction; ligament long and elliptical; large lunular area in front of the beaks. Length, 72; height, 65; diameter, 45 mm. (Conrad.)

TYPE in U. S. N. M.? Type locality, Miocene of Washington.

RANGE. Off Alaska Peninsula to Puget Sound. In the Pliocene of California and Washington and Miocene of same range.

Thyasira barbarensis Dall, 1889.

Plate 53, fig. 3.

Proc. U. S. N. M., **12**:261; pl. 8, fig. 9.

Shell white, superficially chalky, rather compressed, rounded below, the beaks not very prominent; the surface is sculptured only with incremental lines; there is a rather large impressed lunular area not circumscribed by a line; behind there is an upper, narrow and deep radial depression with a lower, wider and less marked second one, with corresponding flexuosities of the posterior margin; a narrow rather deep groove runs near the margin outside the ligament marking off a narrow elongate escutcheon; interior white, unpolished; hinge edentulous. Length, 5; height, 5.1; diameter, 3 mm. (Dall.)

TYPE in U. S. N. M., No. 96973. Type locality, Station 2840, Santa Barbara Islands.

RANGE. Strait of Juan de Fuca to the Gulf of California.

Thyasira gouldii Philippi, 1845.

Plate 34, fig. 5.

Zeitschr. Mal., **2**:74. Binney and Gould, *Inv. of Mass.*, p. 100; fig. 206.

Shell small, globular, posterior side angulated or furrowed; umbones much recurved; surface sculptured with fine incremental lines; lunule indistinct, depressed in front of beaks; ligament external, placed in a groove on the hinge line and outside the hinge plate; teeth wanting. Length, 9.5; height, 11; diameter, 8 mm.

TYPE in State Museum, Albany, New York. Type locality, Massachusetts Bay.

RANGE. Bering Strait to San Diego, California, also Atlantic. In the Pleistocene and Pliocene at Santa Barbara and the Pliocene at San Diego Well, and San Pedro, California.

Thyasira trisinuata Orbigny, 1846.

Moll. Cuba, **2**:300; pl. 27, figs. 26, 49.

Testa transversa, inflata, lævigata, albida, tenui, diaphana; latere buccali brevi, truncato; latere anali trisinuato, radiatim bicostato. Diameter, 4 mm. (Orbigny.)

TYPE in British Museum. Type locality, Martinique and Guadeloupe.

RANGE. Sitka, Alaska, to San Diego, California. Also Atlantic.

Thyasira trisinuata polygona Jeffreys, 1863.

British Conch., **2**:248.

Rather longer in proportion to the breadth, marked by three or four longitudinal ridges, giving the shell an angular form, the grooves on the posterior side being much deeper than usual. (Jeffreys.)

TYPE locality not given.

RANGE. Korea and the Gulf of Alaska to San Diego, California. Also Atlantic.

Thyasira cygnus Dall, 1916.

Plate 3, fig. 10.

Proc. U. S. N. M., **52**:409.

Shell white with a pale straw-colored periostracum, moderately convex, sharply compressed behind, the beaks prominent, prosocœlous over a large cordate lunule, the escutcheon long and very narrow, bounded by a sharp keel; general form rounded quadrate, the compressed posterior area narrow and basally falling notably short of the basal curve of the disk; posterior slope slightly convexly arcuate; anterior distinctly concave, meeting the basal arc in an obtuse angulation. Length, 14; height, 13; diameter 8.5 mm. (Dall.)

TYPE in U. S. N. M., No. 222618. Type locality, Station 4224, Cygnet Inlet, Boca de Quadra, Alaska, in 160 fathoms.

RANGE. Southeastern Alaska.

Thyasira excavata Dall, 1901.

Proc. U. S. N. M., **23**:818; pl. 39, figs. 12, 15.

Shell subovate, thin, white, with a pale yellowish periostracum; sculpture of concentric incremental lines, and in each valve three sharp and two or three obscure radial ridges. Beaks small, sub arcuate, not prominent, distinctly prosogyrate; lunule and escutcheon well developed, elongate, rather narrow, and emphatically excavated, bounded by a well-

marked carina, which in the case of the escutcheon is high, thin, and sharp, separated from another less acute radial keel by a wide, deep sulcus; on the disk near the middle are two other radials, evident but obscure, and another a short distance behind the lunular carina. The surface occasionally shows a faint dusting of microscopic granulation, which is usually abraded. Valves moderately convex, the interior polished, the hinge edentulous, nymphs slender and delicate, the ligament narrow and more or less visible externally, the margins of the valve indented by external ridges. Length, 20; height, 17.5; diameter, 15 mm. (Dall.)

TYPE in U. S. N. M., No. 106870. Type locality, off Tillamook, Oregon.

RANGE. Oregon to the Gulf of California.

Thyasira tricarinata Dall, 1916.

Proc. U. S. N. M., **52**:409.

Shell chalky white, produced below, with pointed prosocœlous beaks over a deeply impressed ovate lunule bounded by a sharp carina; escutcheon long, narrow, lanceolate, the valve margin rising as a sharp keel in the middle, the outer border very prominently keeled, outside of which is a similarly shaped excavated area also bordered by an angular keel; still outside of this there is a compressed area with no distinct anterior boundary except an obscure ray near the umbones; over this area the surface is concentrically striated, the rest of the disk being nearly smooth; hinge very feeble, ligament linear. Length, 15; height, 18; diameter, 10 mm. (Dall.)

TYPE in U. S. N. M., No. 209321. Type locality, Station 4425, off Santa Barbara Islands in 1100 fathoms.

RANGE. Known only from the type locality.

Subgenus AXINULUS Verrill and Bush, 1898.

Thyasira ferruginosus Forbes, 1844.

Rept. Brit. Assoc., 1843, p. 192. Forbes and Hanley, *Brit. Moll.*, **2**; pl. 34, fig. 1.

Minute, usually covered with a ferruginous coating, beneath which the surface is smooth; devoid of any fold. Only one denticle in either valve; no oblique cartilage groove on the hinge margin. (Forbes.)

TYPE and type locality unknown to writer.

RANGE. Aleutian Islands. Also Atlantic and Arctic.

Genus **AXINOPSIS** G. O. Sars, 1878.

Shell discoidal, tumid in the middle, compressed toward the margins; umbones slightly prominent; no external ligament; valves thin, pellucid, white, concentrically striate; cardinal tooth in the right valve obtusely

elevated, recurved; in the left valve elongated, subhorizontal; cartilage narrow.

TYPE. *Axinopsis orbiculatus* Sars.

DISTRIBUTION. North Atlantic and north Pacific oceans.

Axinopsis viridis Dall, 1901.

Proc. U. S. N. M., 23:819; pl. 42, fig. 3.

Shell small, polished, suborbicular, when fresh covered with a glistening pale-green periostracum, sometimes exhibiting lighter and darker concentric zones; sculpture solely of fine concentric lines of growth; beaks low, inconspicuous; lunule slightly impressed, but without any bounding sulcus or ridge, small, sublanceolate; escutcheon hardly recognizable, very narrow, and inconspicuous; the part of the lunule belonging to the right valve is slightly larger than the other. The ligament is small and very delicate, but not wholly concealed. The subumbonal tooth of the right valve is prominent and strong, the inflected tooth-like process of the left valve is well developed. Margins of the valves smooth, interior polished, with some obscure radial striæ; muscular and pallial impressions normal. Length, 6.2; height, 6; diameter, 3.3 mm. (Dall.)

TYPE in U. S. N. M., No. 214743. Type locality, Plover Bay, Bering Strait.

RANGE. Arctic Ocean and east Aleutian Islands to the Coronado Islands, Lower California. Also Japan.

Axinopsis sericatus Carpenter, 1864.

Plate 4, fig. 4.

Suppl. Rep. Brit., Assoc., p. 643. *Proc. U. S. N. M.*, 23; pl. 40, fig. 2.

Shell small, circular, flat; epidermis silken. (Carpenter.)

TYPE locality, Catalina Island, California.

RANGE. Aleutian Islands to Catalina Island.

Family DIPLODONTIDÆ.

Genus **DIPLODONTA** Brown, 1831.

Shell suborbicular, smooth; ligament double, rather long, submarginal; hinge teeth 2.2, of which the anterior in the left valve, and posterior in the right are bifid; muscular impressions polished, anterior elongated. (Tryon. S. S. Conch.)

TYPE. *Venus lupinus* Brocchi.

DISTRIBUTION. West Indies, Rio de Janeiro, Britain, Mediterranean, Red Sea, West Africa, India, Korea, Australia, California.

RANGE IN TIME. Cretaceous, Pleistocene.

Diplodonta aleutica Dall, 1901.

Proc. U. S. N. M., **23**:820; pl. 42, fig. 3.

Shell large, coarse, chalky, with a papery dehiscent periostracum, usually with the exterior more or less eroded; form somewhat longer than high, tumid, equivalve and nearly equilateral, the anterior end of the shell less rotund than the posterior; surface in the adult with rather irregular and marked concentric lines of growth; ligament external, set in a groove, with well-marked nymphs; teeth normal, slender, and delicate, in the adult more or less defective; beaks low and inconspicuous, slightly nearer the anterior end; interior chalky, the margins entire, the posterior muscular impression larger than the anterior. The young are proportionately more elongate and less tumid, with smooth silky olivaceous periostracum. Longitude of adult, 26.5; altitude, 22; diameter, 14 mm. (Dall.)

TYPE in U. S. N. M., No. 207325. Type locality, Kyska Harbor, Aleutians, in 8 fathoms.

RANGE. Cape Lisburne, Arctic Ocean, to Aleutian Islands and Sitka Bay, Alaska.

Diplodonta orbella Gould, 1852.

Plate 6, figs. 5, 6.

Proc. Bost. Soc. Nat. Hist., **4**:90. *Bost. Jour. Nat. Hist.*, pl. 15, fig. 3.

Shell small, rather thin, subglobose, dingy white, marked with delicate lines of growth, which at some parts are more conspicuous than at others, and render the surface somewhat irregular; beaks very nearly median, not prominent; no distinct lunule in front of them; ligament prominent; extremities a little above the middle of altitude, very nearly symmetrical. Interior white, hinge with two direct teeth in the right valve, of which the anterior is smallest, and the posterior is bifid; and two in the left valve, of which the anterior is bifid and the posterior very oblique; lateral teeth none; muscular impressions faint, very large; pallial impression indistinct, composed of a series of polished dots. Length, $\frac{4}{5}$; height, $\frac{6}{8}$; diameter, $\frac{5}{8}$ of an inch. (Gould.)

TYPE locality, San Diego, California.

RANGE. Pribiloff Islands to the Gulf of California.

Diplodonta subquadrata Carpenter, 1855.

Proc. Zool. Soc., p. 230.

Testa subquadrata, valde inæquilaterali, antice brevi; tenui, albo-flavescente, epidermide, tenuissima; striis incrementi exillimis, ligamento subexterno; dentibus cardinalibus parvis; lateralibus antico in utraque valva acuto, postico subobsoleto; cicatricibus muscularibus, antica a cardine remota, elongata, intus crenulata; postica irregulariter pyriformi; linea pallii margini appropinquante. Long., 76; lat., 89; alt., 57 poll. (Carpenter.)

Shell more compressed and thinner than *D. orbella,* and of a different outline. In the description the edge of the excavated hinge plate has been mistaken for a lateral tooth.

TYPE in Museum Cuming. Type locality, Mazatlan, Mexico.

RANGE. Catalina Island, California, to Panama.

Subgenus FELANIELLA Dall, 1899.

Diplodonta sericata Reeve, 1850.

Conch. Iconica, **6**; pl. 9, fig. 55. (As a *Lucina.*)

Shell somewhat squarely orbicular, inclined obliquely on the posterior side, thin, depressed, concentrically impressly striated, no lunule; semi-transparent white, covered with a shining pale olive horny epidermis. (Reeve.)

TYPE in British Museum. Type locality not known.

RANGE. San Diego, California, to Panama.

Family LUCINIDÆ

Genus **LUCINA** Bruguière, 1797.

Shell inflated thin, concentrically striated, anterior and posterior dorsal areas obsolete; lunule deep and narrow, no visible escutcheon; ligament and resilium deeply inset but not occluded; margins entire, anterior adductor scar long, hinge wholly edentulous, shell usually large. (Dall.)

TYPE. *Venus edentula* Linnæus.

DISTRIBUTION. Universal.

RANGE IN TIME. Upper Silurian.

Lucina edentuloides Verrill, 1870.

Amer. Jour. Sci., **49**:226.

Closely allied to *L. edentula* of the West Indies and the Gulf of Mexico. It is subglobose, and much more swollen than *L. edentula.* The apex is more prominent and curved, and the lunular region more deeply excavated. The ligament is shorter and its supporting plate is not so stout, and its inner edge but little elevated above the ligament groove. Length, 1.65; height, 1.50; breadth, 1.10 inches. (Verrill.)

TYPE locality, La Paz, Lower California.

RANGE. San Clemente Island, California, to the Gulf of California.

Genus **PHACOIDES** Blainville, 1825.

Shell lentiform, with strong dorsal areas and chiefly concentric sculpture, the cardinal teeth obsolete in the adult, but the laterals well developed.

TYPE. *Tellina pectinata* Gmelin.

DISTRIBUTION. Universal.

Subgenus HERE Gabb, 1866

Phacoides richthofeni Gabb, 1866.

Pal. Cal., **2**:29; pl. 8, fig. 49.

Shell subglobose, nearly equilateral; beaks small, inclined forward; margins regularly rounded; a more or less distinctly marked groove passes from the beaks to the posterior margin. Surface marked by numerous, more or less regular, distinct rounded ribs. (Gabb.)

TYPE in University of California Collection. Type locality, Fernando Valley north of Los Angeles in the Pliocene.

RANGE. San Pedro, California, to Cape St. Lucas, Lower California, recent. In the Pliocene at San Fernando, California.

Subgenus LUCINISCA Dall, 1901.

Phacoides nuttallii Conrad, 1837.

Jour. Acad. Nat. Sci., Phila., p. 255; pl. 20, fig. 2.

Shell lenticular, slightly compressed; disks cancellated; concentric lines very regular, lamelliform, prominent; anterior fold small, marginal; extremity emarginate above; cardinal and lateral teeth distinct; inner margin minutely crenulated. (Conrad.)

TYPE in Acad. Nat. Sci., Phila.? Type locality, California.

RANGE. Santa Barbara, California, to Mazatlan, Mexico. In the Pliocene at San Diego and the Pleistocene at Santa Barbara, San Pedro, and San Diego, California.

Subgenus LUCINOMA Dall, 1901.

Phacoides annulatus Reeve, 1850.

Plate 33, figs. 5a, 5b.

Conch. Iconica, Lucina, **6**; pl. 4, fig. 17.

Shell orbicular, rather flattened, inequilateral, concentrically laminately ridged, ridges sharp, erect, interstices concentrically striated, lunule lanceolately ovate, rather deeply excavated; semi-transparent white. (Reeve.)

TYPE in Cuming Collection. Type locality, California.

RANGE. Port Althorp, Alaska, to the Coronado Islands, Lower California. In the Upper Miocene at Santa Margarita and the Pliocene and Pleistocene in California.

Phacoides annulatus densiliratus Dall, 1919.

Proc. Biol. Soc. Wash., **32**:249.

The typical *P. annulatus* has the concentric sculpture rather regularly and widely spaced; this variety has it closely crowded and less lamellose, giving a different aspect to the shell, which otherwise does not differ from

the typical *annulatus*. Length, 54; height, 50; diameter, 25 mm. (Dall.)

TYPE in U. S. N. M., No. 108819. Type locality, Harbor of Sitka, Alaska, Station 92.

RANGE. Sitka, Alaska, to Esteros Bay, California.

Phacoides æquizonatus Stearns, 1890.

Proc. U. S. N. M., 13:220; pl. 17, figs. 3, 4.

Shell moderately convex, dull white chalky where eroded; epidermis of a dull dingy light yellowish tinge, finely wrinkled in old specimens, and inclined to be deciduous and slightly flaky or ragged; in young shells, translucent, shiny, and nearly colorless. Valves transversely ovate, being broader than high; the posterior side is abruptly squarish, and the dorsal line slants gradually from the umbones; on the anterior side the dorsal outline is moderately concavely curved away from the beaks, and in the young and perfect specimens a very slight angulated pinch may be seen extending from the lunule to the anterior edge of the valve. The beaks or umbones are small, inclined toward the lunule; the lunule is quite narrow, attenuated lanceolate and elongated. Surface of valves transversed with fine concentric growth lines, and prominent rather regularly spaced thread-like ridges. Hinge line curved and showing two diverging cardinal teeth in each valve; the anterior one in the left valve, and the posterior one in the right valve, notched or partially cloven. Elongated, tuberculoid lateral teeth in both valves at extreme limit of dorsal line. From beaks to ventral margin, 37.50; from anterior to posterior edges of valves, 46.25 mm. (Stearns.)

TYPE in U. S. N. M., No. 104044. Type locality, off Santa Barbara Islands, California, in 276 fathoms.

RANGE. Santa Barbara Islands, California, to South Latitude 38 (Chile).

Subgenus CALLUCINA Dall, 1901.

SECTION EPILUCINA Dall, 1901.

Phacoides californicus Conrad, 1837.

Jour. Acad. Nat. Sci., Phila., 7:255; pl. 20, fig. 1.

Shell lenticular, with coarse concentric striæ; posterior extremity direct; lunule small, elliptical, impressed, transversely striated, prominent in the right valve, and fitting into a corresponding depression in the left; cardinal and lateral teeth prominent. (Conrad.)

TYPE in U. S. N. M. or State Museum, Albany, New York.

RANGE. Crescent City, California, to San Ignacio Lagoon, Lower California. In the Pleistocene at Santa Barbara, San Pedro and San Diego, California.

Subgenus PARVILUCINA Dall, 1901.

Phacoides tenuisculptus Carpenter, 1865.

Plate 15, fig. 6, and plate 33, figs. 1a, 1b.

Suppl. Rep. Brit. Assoc., p. 642. *Proc. U. S. N. M.*, **23**; pl. 40, fig. 5.

Shell small, orbicular, deeply convex, thin; umbones prominent, central; surface sculptured by numerous fine, concentric lines and radiating striæ; lunule prominent, the greater part being in the right valve; cardinal teeth small, laterals prominent; anterior muscle-impressions not as elongated as in *P. acutilineata* and others. Length, 2–5 mm. (Arnold.)

TYPE in U. S. N. M. Type locality, Vancouver Island.

RANGE. Nunivak Island, Bering Sea, to Coronado Islands, Lower California. In the Pleistocene at San Pedro and San Diego and the Pliocene at San Diego Well.

Phacoides approximatus Dall, 1901.

Proc. U. S. N. M., **23**:828; pl. 39, fig. 4.

Shell small, tumid, nearly equilateral, white with a yellowish periostracum; beaks high, full with a rather emphatically depressed lanceolate lunule; sculpture of numerous fine, rounded, usually entire riblets separated by narrow sulci on the disk, but absent from the dorsal areas; concentric sculpture of low, feeble, distant, elevated lines which become feebly lamellose on the dorsal areas; hinge, especially the laterals, strong, normal; muscular scars as usual; basal margin conspicuously crenulated. Length, 6.3; height, 6.5; diameter, 4 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Gulf of California?

RANGE. Monterey, California, to Panama.

Genus **DIVARICELLA** Martens, 1880.

Valves suborbicular, convex, subequilateral, with inconspicuous beaks, no dorsal areas, two cardinal teeth in each valve, the laterals variable, the posterior distant, usually obsolete; the anterior feeble, adjacent; ligament and resilium set in a groove, but not internal, the excavated striæ forming an angle on a line radial from the beaks.

TYPE. *Lucina ornata* Reeve.

DISTRIBUTION. Practically universal.

RANGE IN TIME. From the Eocene.

Divaricella perparvula Dall, 1901.

Proc. U. S. N. M., **23**:815; pl. 39, fig. 8.

Shell small, globular, with rather sparse external sculpture, more tumid than the young of *D. eburnea*. A new name for *D. pisum* Philippi. (Dall.)

TYPE in U. S. N. M. Type locality, Cape San Lucas, Lower California.
RANGE. Monterey, California, to Cape San Lucas and Ecuador.

Family LEPTONIDÆ

Genus **ERYCINA** Lamarck, 1806.

Shell equivalve, subinequilateral, usually transversely oval; one or two unequal, diverging cardinal teeth, separated by a pit; lateral teeth oblong, compressed, short; ligament external and internal; muscular impressions rounded, pallial line simple.

RANGE. Pacific.

RANGE IN TIME. Cretaceus, Eocene of North America and Paris Basin.

Erycina catalinæ Dall, 1916.

Proc. U. S. N. M., **52**:409.

Shell small, inequilateral, the anterior side shorter, rounded, the base nearly straight; posterior side also rounded, slightly attenuated, the dorsal slope convex but descending; hinge strong, the teeth well developed; the beaks well developed, not prominent, the surface smooth except for faint incremental lines, covered with a light yellowish-brown dull periostracum. Length, 2.5; height, 2; diameter, .2 mm. (Dall.)

TYPE in U. S. N. M., No. 210879. Type locality, Catalina Island, California.

RANGE. Known only from the type locality.

Erycina coronata Dall, 1916.

Proc. U. S. N. M., **52**:409.

Shell small, white, rounded quadrate, nearly equilateral, the surface finely concentrically striated; basal margin nearly straight; ends rounded, the posterior a little produced basally, the dorsal slopes similar, slightly descending, with at each end two or four minute elevated spinules. Length, 4; height, 3; diameter, 1.2 mm. (Dall.)

TYPE in U. S. N. M., No. 225193. Type locality, off the Coronado Islands, Lower California.

RANGE. Known only from the type locality.

Erycina bakeri Dall, 1916.

Proc. U. S. N. M., **52**:410.

Shell small, white with a pale yellowish periostracum, subquadrate, inequilateral, the anterior end shorter; hinge line short, straight, at the outer extremities usually a small spinule, beaks pointed, the prodissoconch

visible; from the beak extends a wide depression obliquely backward to the middle of the base, becoming more defined distally; at the base in the adult it is strongly marked and emphasized by a rounded sulcus in the margin, behind which the surface rises into a rounded ridge armed with one or more elevated short lamellæ, and having its basal termination produced into a short hook; hinge rather feeble, valves rather compressed. Length, 6.3; height, 4.5; diameter, 2 mm. (Dall.)

TYPE in U. S. N. M., No. 225192. Type locality, off South Coronado Island, Lower California.

RANGE. Known only from the type locality.

Erycina balliana Dall, 1916.

Proc. U. S. N. M., **52**:410.

Shell small, with the outline of a very compressed *Kellia*, white with a very pale yellowish periostracum, concentrically microscopically threaded, the threads occasionally becoming microscopically lamellar; valves nearly equilateral, the anterior part slightly longer, base evenly arcuate, the posterior end somewhat attenuated. Length, 3; height, 2.9; diameter, 1.7 mm. (Dall.)

TYPE in U. S. N. M., No. 225191. Type locality, off South Coronado Island.

RANGE. Known only from the type locality.

Erycina chacei Dall, 1916.

Proc. U. S. N. M., **52**:410.

Shell small, compressed, rounded-quadrate; nearly equilateral, the anterior end slightly shorter; beaks low, pustular, minute; dorsal margin nearly straight, basal margin gently arcuate; surface finely concentrically striate, whitish under a pale ashy periostracum, both ends nearly evenly rounded, hinge very feeble. Length, 5.3; height, 3.5; diameter, 1.8 mm. (Dall.)

TYPE in U. S. N. M., No. 211219. Type locality, Station 4343, off the South Coronado Island, in 155 fathoms.

RANGE. Santa Rosa Island, California, to the Coronado Islands, Lower California.

Erycina santarosæ Dall, 1916.

Proc. U. S. N. M., **52**:411.

Shell small, compressed, whitish, with a thin pale brownish dull periostracum; profile approaching *E. balliana* but more elongated, and the surface smooth, almost polished and without the microscopic concentric sculpture; evenly ovate equilateral, the anterior end a trifle shorter; beaks

low, pustular, the prodissoconch very small but distinct. Length, 4; height, 3.5; diameter, 1.5 mm. (Dall.)

TYPE in U. S. N. M., No. 194339. Type locality, Santa Rosa Island, California.

RANGE. Known only from the type locality.

Genus **KELLIA** Turton, 1822.

Shell small, thin, suborbicular, closed; beaks small; margins smooth; ligament internal, interrupting the margin, or on the thickened margins; cardinal teeth; 1 or 2 laterals 1–1 in each valve. (Tryon. S. S .Conch.)

TYPE. *Mya suborbicularis* Montagu.

DISTRIBUTION. Norway, New Zealand, California.

RANGE IN TIME. Eocene, Pleistocene.

Kellia laperousei Deshayes, 1839.

Plate 10, fig. 2, and plate 33, fig. 4.

Rev. Zool. Soc. Cuvierienne, p. 357. Guerin, *Mag. de Zool., Moll.;* pl. 12, figs. 5, 6.

Shell of medium size, suborbicular, convex thin; umbones slightly anterior, not prominent; surface sculptured by fine incremental lines which are slightly variable as to prominence; no lunule; each valve with one very prominent cardinal tooth; right valve with two posterior laterals, left with one; hinge area lacking between cardinal and lateral teeth; muscle impressions not distinct. Length, 23; height, 19; diameter, 11 mm. (Arnold.)

TYPE locality not given.

RANGE. Bering Sea and Pribiloff Islands to San Diego, California. In the Pliocene at San Pedro and the Pleistocene at San Pedro and San Diego, California.

Kellia suborbicularis Montagu, 1804.

Test. Brit., p. 39; pl. 26, fig. 6.

Mya with a sub-pellucid, sub-orbicular shell, of a yellowish-white color, frequently covered with a brown epidermis; faintly striated transversely, somewhat glossy; margin opposite the hinge nearly straight; sides nearly equal, rounded; hinge central; beaks small, pointed, turning to one side; in one valve a single tooth immediately under the beak, locking into a double one in the opposite valve; with a laminated tooth behind the beak in each, somewhat remote. Inside glossy white; valves shut close. Length rather exceeding ⅜ of an inch; breadth, ½ inch. (Montagu.)

TYPE in British Museum. Type locality, Plymouth, England.

RANGE. Bering Island, the Aleutians, and south to Panama. Also Atlantic. In the Pleistocene at San Pedro, California.

Genus **ALIGENA** H. C. Lea, 1845.

Shell rounded, triangular, inflated; single small anterior tooth under the beaks, separated by a gap from the surface of attachment, under the posterior dorsal margin, of an elongate internal resilium carrying a lithodesma. Pal. San Pedro. (Arnold.)

TYPE. *Aligena striata* Lea.

RANGE. California to Lower California.

RANGE IN TIME. Miocene, Pleistocene.

Aligena cerritensis Arnold, 1903.

Pal. San Pedro, p. 138; pl. 13, fig. 3.

Shell small, rounded, triangular, inflated, thin; inequilateral, the umbo being nearly terminal posteriorly; anterior dorsal margin nearly straight; anterior extremity quite sharply rounded and produced furthest below middle; posterior extremity sloping off abruptly from umbo and rounded near the base; ventral margin arcuate with faint concentric sculpture; umbones small, pointed anteriorly twisted, with a minute tooth below them on the cardinal margin; pallial line entire; muscle scars subequal. Length, 8.6; height, 8; diameter, 5 mm. (Arnold.)

TYPE in U. S. N. M. Type locality, Upper San Pedro series, Los Cerritos.

RANGE. La Jolla, California, to Magdalena Bay, Lower California. In the Pleistocene at San Pedro, California.

Genus **ROCHEFORTIA** Vélain, 1846.

Shell ovate or rounded-triangular, periostracum adherent, usually polished; individuals free or domiciliary in the burrow of crustaceans. (Dall.)

TYPE. *Rochefortia australis* Vélain.

DISTRIBUTION. Northern Pacific and Atlantic oceans.

Rochefortia tumida Carpenter, 1864.

Plate 54, figs. 11 to 14.

Suppl. Rep. Brit. Assoc., p. 129. *Proc. U. S. N. M.,* 21; pl. 87, fig. 7.

Shell subelliptical, both ends broadly rounded, lines of growth fine, ossicle minute. (Carpenter.)

TYPE in U. S. N. M. Type locality, Vancouver Island, British Columbia.

RANGE. Shumagin Islands, Alaska, to San Diego, California.

Rochefortia planata Dall, 1885.

Arch. f. Naturg, 51:34. *Proc. U. S. N. M.,* 21; pl. 88, fig. 12, 1899.

Testa minuta, forma oblique ovata, extremitate antica producta, postica brevissima margine ventrali convexo, posteriore abrupte declivi; valvulæ,

tenues, modice et æqualiter convexæ, intus subtiliter radiatim striatæ, epidermide fusca sat conspicua tectæ. Long., usque ad 8.5 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Arctic Ocean.

RANGE. Icy Cape, Arctic Ocean, to Shumagin Islands, Alaska.

Rochefortia ferruginosa Dall, 1916.

Proc. U. S. N. M., **52**:411.

Shell small, white, thin, subdonaciform, compressed, invariably coated with a ferruginous layer like some species of *Axinulus,* inequilateral; anterior side longer, apical angle about 90; both ends rounded base arcuate. Length, 4.5; height, 3.25; diameter, 1.5 mm. (Dall.)

TYPE in U. S. N. M., No. 214413. Type locality, San Francisco Bay, California.

RANGE. San Francisco Bay to Santa Rosa Island, California.

Rochefortia beringensis Dall, 1916.

Proc. U. S. N. M., **52**:411.

Shell large for the genus, oval, white with an olivaceous periostracum, thin, somewhat compressed, sculptured rudely with low irregular concentric ridges; inequilateral, posterior end longer, both rounded; beaks not prominent, hinge small and feeble, except that the resilium and its attachments are rather large. Length, 11.5; height, 10; diameter, 4 mm. (Dall.)

TYPE in U. S. N. M., No. 210951. Type locality, Bering Island, Bering Sea.

RANGE. Known only from the type locality.

Rochefortia grebnitzskii Dall, 1916.

Proc. U. S. N. M., **52**:411.

Shell small, translucent, polished, whitish; nearly equilateral; general shape that of *Bornia,* but without the brilliant surface; sculpture of fine concentric lines visible under a glass, which render the surface dull; beaks rather prominent, hinge weak. Length, 3.25; height, 2.5; diameter, 1.3 mm. (Dall.)

TYPE in U. S. N. M., No. 207258a. Type locality, Bering Island, Bering Sea.

RANGE. Known only from the type locality.

Rochefortia aleutica Dall, 1899.

Proc. U. S. N. M., **21**:892; pl. 87, fig. 6.

Shell small, solid, ovate, white, smooth covered with a polished straw-colored epidermis with usually three or four concentric darker colored zones; beaks distinct, often eroded, ends and base rounded, valves moder-

ately convex; teeth strong in the right valve, anterior adductor scar narrow and rather irregular, elongated, posterior rounded, pallial scar linear. Length, 4.3; height, 3.3; diameter, 2 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Bering Sea?

RANGE. Bering Sea to Coronado Islands, Lower California.

Rochefortia compressa Dall, 1913.

Plate 21, fig. 7.

Proc. U. S. N. M., **45**:596. *Bull. U. S. N. M.*, **112**; pl. 3, fig. 1.

Shell small, thin, glossy, compressed, subovate, inequilateral; beaks low pointed, inconspicuous; surface very finely, sharply, evenly, concentrically striated; anterior end longer, evenly rounded; posterior more pointed; interior polished, the muscular scars perceptible, small; hinge small and weak, constructed of two feeble laterals in each valve and a median internal resilium. Length, 7; height, 6; diameter, 2 mm. (Dall.)

TYPE in U. S. N. M., No. 214445. Type locality, Gulf of California.

RANGE. Shumagin Islands, Alaska, to the Gulf of California.

Rochefortia pedroana Dall, 1899.

Proc. U. S. N. M., **21**:893; pl. 88, fig. 4.

Shell large, thin, rounded, rather compressed, white, with a concentrically rugose pale-brownish epidermis (to which, in the type adheres a good deal of blackish oxide of iron); beaks inconspicuous; surface with coarse, concentric, incremental lines; inequilateral; the posterior side short, dorsal margins merging roundly into the distal and they into the basal margin, which last is nearly straight; hinge feeble, the right anterior lamella elongated and very slender; the posterior one shorter and stouter, the resilium subumbonal and very small; adductor scars small, the pallial scar linear. Length, 9; height, 7.3; diameter, 3 mm. (Dall.)

TYPE in U. S. N. M. Type locality, on beach at San Pedro, California.

RANGE. Known only from the type locality.

Rochefortia grippi Dall, 1912.

The Nautilus, **25**:128.

Shell small, thin, equilateral, ovoid, with a dull brownish periostracum more or less encrusted with iron oxide, and sculptured only by feeble incremental lines. Beaks inconspicuous, hinge as in the genus, bearing two very small diverging cardinals in one valve with a rather strong resilium between them which seems to carry a small lithodesma; opposite valve edentulous; pallial line entire; inner margins of the valves simple. Length, 4.5; height, 2.5; diameter, 1.3 mm. (Dall.)

TYPE in U. S. N. M. Type locality, off entrance to San Diego Harbor, in 16–20 fathoms.

RANGE. Known only from the type locality.

Rochefortia golischi Dall, 1916.

Proc. U. S. N. M., **52**:412.

Shell subquadrate, compressed, thin, white, very inequilateral; the anterior end very short, beaks low, 1 mm. behind the anterior end; posterior end rounded almost exactly like the anterior, base gently arcuate; surface polished, minutely concentrically rippled; prodissoconch visible; hinge weak, the resilifer large, obliquely inclined backward. Length, 6; height, 5.5; diameter, 2.5 mm. (Dall.)

TYPE in U. S. N. M., No. 210876. Type locality, Station 2900, off Santa Rosa Island, California, in 13 fathoms.

RANGE. Known only from the type locality.

Genus **SERRIDENS** Dall, 1899.

Shell oval, with two diverging teeth in each valve, the anterior being conspicuously shorter than the posterior, sulcated near the beaks, ligament situated in a groove between them.

TYPE. *Phistiphora oblonga* Carpenter.

DISTRIBUTION. California coast.

Serridens oblonga Carpenter, 1865.

Plate 54, figs. 5, 6, 7, 8.

Proc. Cal. Acad. Nat. Sci., 1865, p. 210.

P. t. oblonga, parva, subquadrata, valde inæquilaterali; parte antica fere nulla; marginibus, dorsalibus subrectis, fere rectangulatis, ventrali parum excurvato, postico rotundato; umbonibus antice flectis; lunula parva, concava; intus, v. sinistr., dent. lat. post. per totam longitudinem dorsalem decurrente, parte cardinali acuta, alte transversim sulcata; ant. secundum incurvato curto, serrato; cicatr. adduct. sub fines dentium sitis. Long., 0.14; lat., 0.10; alt., 0.06.

Like a *Tellimya*, with long marginal teeth, serrated near the hinge. (Carpenter.)

TYPE in U. S. N. M.? Type locality, San Diego, California.

RANGE. Puget Sound to Coronado Islands, Lower California.

Genus **PSEUDOPYTHINA** Fischer, 1884.

Shell rather large for the family, reniform with a coarse rugose periostracum; hinge with two projections of the right dorsal margin

fitting into sulci of the opposite valve, one right and one left cardinal, a strong internal ligament; laminæ absent or not distinct.

TYPE. *Kellia mac'andrewi* Fischer.

DISTRIBUTION. Coast of Europe and Pacific coast of North America from the Arctic to Mexico. All the species are commensals.

Pseudopythina rugifera Carpenter, 1864.

Plate 15, fig. 9, and plate 38, figs. 8, 9.

Suppl. Rep. Brit. Assoc., p. 643. *Rep. Progress Geol. Surv. Canada*, 1880, p. 198, B, fig. 2.

Shell large, thin, slightly indented; teeth minute; epidermis shaggy. (Carpenter.)

TYPE locality, Puget Sound. Commensal with *Gebia*.

RANGE. Known only from the type locality.

Pseudopythina compressa Dall, 1899.

Plate 11, fig. 11.

Proc. U. S. N. M., **21**:888; pl. 87, figs. 1, 8.

Shell large, subquadrate, thin, moderately compressed, white, covered with a conspicuous, thin wrinkled, partly glossy periostracum; nearly equilateral, the basal margin nearly straight; beaks inconspicuous, surface with strong, irregular incremental lines, but no radial sculpture; pallial scar rather wide and irregular, merging into the subequal, rather narrow adductor scars; resilium large, wide, and long, more or less calcareous ventrally, left valve with one obscure cardinal tooth, right valve with the tooth better developed; the right dorsal valve margins overlap those of the left valve a little, but there are no distinct lamellæ. Length, 18; height, 13; diameter, 6 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Bering Sea, south of Nunivak Island, in 4–28 fathoms.

RANGE. Cape Lisburne, Arctic Ocean, to Acapulco, Mexico. Commensal with Crustaceans.

Pseudopythina myaciformis Dall, 1916.

Proc. U. S. N. M., **52**:412.

Shell small, myaciform, plum, nearly equilateral, the posterior end slightly shorter, wider, and rounded; anterior end more attenuated; surface finely concentrically threaded, but obscured by an habitual coating of a blackish color, probably manganese; the shell underneath it is yellowish white; hinge weak, the ligament carrying a long, very narrow, lithodesma. Length, 8.5; height, 5.5; diameter, 3 mm. (Dall.)

TYPE in U. S. N. M., No. 133234. Type locality, Port Orchard, Puget Sound.

RANGE. Puget Sound. Commensal with Crustaceans.

Genus **BORNIA** Philippi, 1836.

Shell elongately oval, with slightly projecting beaks, almost equilateral, surface finely concentrically striated; hinge with three teeth in the left valve, two small anterior and one somewhat remote and elongated posterior, right valve with only two diverging elongated cardinal teeth; cartilage situated in a groove in front of the posterior teeth; muscular impressions faintly marked. (Tryon. S. S. Conch.)

TYPE. *Erycina corbuloides* Bivona.

DISTRIBUTION. Norway, New Zealand and California.

RANGE IN TIME. From the Eocene to the present.

Bornia retifer Dall, 1899.

Proc. U. S. N. M., **21**:889; pl. 87, fig. 2.

Shell thin, white, moderately convex, rounded, trigonal, nearly equilateral; beaks distinct, not high; surface polished, with faint incremental lines and minute close punctations whose interspaces give the effect of a fine netting; hinge normal, delicate; adductor scars rounded, high up; posterior basal margin very slightly crenulated. Length, 12; height, 9; diameter, 4 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Station 2900, off Santa Rosa Island, California, in 13 fathoms.

RANGE. Monterey to Santa Barbara, California.

Genus **LEPTON** Turton, 1822.

Shell suborbicular, compressed, smooth or shagreened, a little opened at the ends and longest behind; hinge teeth 0.1 or 1.1 in front of an angular cartilage notch; lateral teeth, 2.2 and 1.1. (Tryon. S. S. Conch.)

TYPE. *Solen squamosus* Montagu.

DISTRIBUTION. Universal. Laminarian and coralline zones.

RANGE IN TIME. Eocene.

Lepton meröeum Carpenter, 1864.

Suppl. Rep. Brit. Assoc., p. 643.

Shell shaped like *Sunapta.* (Carpenter.)

TYPE locality, between San Pedro and San Diego, California.

RANGE. San Pedro to San Diego, California.

Genus **LASÆA** Leach, 1827.

Shell minute and roundish oval; beaks straight; cartilage long, placed at the shorter end of the shell, contrary to that in *Kellia;* left valve with a minute thorn-like cardinal tooth; and in each valve two remarkably strong teeth. (Tryon. S. S. Conch.)

TYPE. *Cardium rubrum* Montagu.
DISTRIBUTION. Universal.
RANGE IN TIME. Tertiary.

Lasæa rubra Montagu, 1804.

Test. Brit., p. 83; pl. 27, fig. 4.

Shell with a convex, smooth, glossy, pellucid, red shell; hinge not quite central; rather broader than it is long, rounded at both ends; umbo prominent; hinge with nearly obsolete primary teeth; lateral ones very conspicuous. Inside glossy red; margin plain. (Montagu.)

HABITAT. Everywhere in crevices of rocks, inside empty cups of Balani and in the byssus of shells, near high-water mark. Sometimes it is found at depths varying from 3–20 fathoms. It has been found in Iceland and Upper Norway. (Jeffreys. British Conch.)

TYPE in British Museum. Type locality, British coast.

RANGE. Vancouver Island, British Columbia, to Callao, Peru. Also Atlantic.

Genus **TURTONIA** Alder, 1848.

Shell oblong, inequilateral, anterior side very short; ligament concealed between the valves; hinge teeth 2.2. (Tryon. S. S. Conch.)

TYPE. *Venus minuta* Fabricius.

DISTRIBUTION. Greenland, Norway, Britain.

Turtonia minuta Fabricius, 1780.

Fauna Gronl., p. 412. Forbes and Hanley, *Brit. Moll.*, **2**; pl. 18, fig. 7.

Shell minute, of an oval and very slightly sub-cordate shape, thin, semi-transparent, very inequilateral, slightly glossy, almost smooth, and of a purplish brown tint, which becomes deeper coloured posteriorly, the front being so pale as, in some specimens, almost to be devoid of colouring matter; the beaks are dark purple. The valves are moderately convex, and rounded at both ends, the termination of the posterior side,—which is much produced,—more obtusely and broadly so; the extremity of the anterior side,—which is both narrow and small, at most occupying one-fourth of the length of the shell, and a very much smaller portion of its area,—simply and regularly so. The ventral margin is subarcuated, and both dorsal lines are decidedly convex, the front one declines strongly, the hinder one scarcely slopes at all. The umbones appear oblique, and when viewed in front are decidedly prominent, they being raised on that side considerably above the dorsal line. The beaks themselves are blunt, and there is no defined lunule in front of them. The internal colouring resembles the external, the margin is plain, and the pallial impression, as

far as can be ascertained, is simple and not sinuated. The cardinal edge is very narrow, only jutting out just at the shorter side, to which portion of it the dentation is confined. The extreme minuteness of the teeth almost baffles one's eyesight, even when aided by the most powerful lens. Length, $\frac{1}{12}$ of an inch; breadth, a trifle more than half that. (British Mollusca.)

TYPE locality, Greenland.

RANGE. Bering Strait to Magdalena Bay, Lower California. Also North Atlantic.

Turtonia occidentalis Dall, 1871.

Amer. Jour. Conch., **7**:150; pl. 14, figs. 12, 13.

Shell subtrigonal, slightly inequilateral, small and smooth. Color purplish; lighter, with a yellowish epidermis, toward the margin, especially anteriorly; interior dark purple in the middle of the valves, margins lighter, dark brown above and behind. Hinge line and ventral margin roundly arcuate, ends rounded, anterior a little shorter and smaller. Epidermis yellowish brown, polished, with rather strong lines of growth at intervals. Umbones rather prominent, usually eroded. Shell a little tumid. Teeth strong, apparently three cardinals in the left valve, with the posterior dorsal hinge margin folded in making a strong tooth-like lamella. Right valve with one long and one triangular cardinal tooth, and a posterior lamella as in the other. Pallial line simple, slightly waved near the posterior muscular scar. Anterior scars two, perfectly separate and distinct, the upper triangular, slightly smaller. Length, .2; height, .16; diameter, .1 inch. (Dall.)

TYPE in U. S. N. M. Type locality, Plover Bay, Eastern Siberia.

RANGE. Known only from the type locality.

Genus **SPORTELLA** Deshayes, 1858.

Shell oblong, smooth, depressed, subequilateral; valves closed. Hinge narrow, with two unequal, diverging teeth in the left valve, one in the other; the lateral teeth are wanting. Muscular scars large, oval, nearly equal; pallial line simple. Ligament external. (Tryon. S. S. Conch.)

TYPE. *Psammotea dubia* Deshayes.

DISTRIBUTION. Living on the coast of California.

RANGE IN TIME. Tertiary of Europe and Eastern United States.

Sportella californica Dall, 1899.

Proc. U. S. N. M., **21**:885; pl. 88, fig. 5.

Shell small, compressed, rude, with a yellowish epidermis; slightly arcuate, dorsal margin evenly arched, base concavely arcuate; inequilateral,

the anterior part longer, rounder, the posterior end more blunt; teeth normal, the larger right cardinal nearly parallel with the dorsal margin, the ligamentary nymph obscure, the attachment for the resilium thickened and projecting; scar of the mantle wide and somewhat irregular, the anterior adductor scar not well distinguished from it. Length, 6; height, 4.2; diameter, 1.5 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Monterey, California.

RANGE. Known only from the type locality.

Genus **ANISODONTA** Deshayes, 1858.

Shell transversely elongated, compressed, inequilateral; hinge thick; a large conical tooth and a triangular socket in each valve; ligament external. Anterior adductor scar very small, and comprised between two prominent ribs (one parallel and the other transverse to the anterior border); posterior scar subcircular, superficial; pallial line faint, entire. (Tryon. S. S. Conch.)

TYPE. *Anisodonta complanatum* Deshayes.

DISTRIBUTION. Living on the California coast.

RANGE IN TIME. Tertiary of Europe.

Anisodonta? pellucida Dall, 1916.

Proc. U. S. N. M., **52**:411.

Shell minute, white, pellucid, rounded triangular, smooth and polished; beaks prominent, dorsal slopes convexly arcuate behind, straighter in front; base arcuate, valves moderately arcuate with entire margins; hinge with developed anterior and posterior laterals and two cardinals, the anterior tooth bifid. Length, 2.3; height, 2; diameter, 1.3 mm. (Dall.)

TYPE in U. S. N. M., No. 208475. Type locality, Monterey Bay, California.

RANGE. Known only from the type locality.

Family CHLAMYDOCONCHIDÆ.

Genus **CHLAMYDOCONCHA** Dall, 1884.

The animal when living is somewhat of the shape of a small globose *Cypræa*, of inflated ovoid form, translucent, jelly-like, dotted above with small, rounded papillæ, which appear of an opaque white on the general translucent ground. The mantle which covers the dome of the body is tough and thick; the sides are smooth, and nearly free from papillæ. The superior medial line is a little depressed. The basal part of the anterior end in life is prolonged beyond the general mass in a wide trough, with the convexity upward, and somewhat expanded at its anterior extremity. About one-third of the way from the anterior end, the mantle is per-

forated by an orifice, which pierces it in the vicinity of the mouth. The edges of this orifice project from the general surface, and it is lined with close-set, small papillæ. At about the same distance from the posterior end is another tubular perforation, holding a similar relation to the anus; which has, however, plain edges, and is not internally papillose. (Dall.)

TYPE. *Chlamydoconcha orcutti* Dall.

DISTRIBUTION. Known only from California.

Chlamydoconcha orcutti Dall, 1884.

Science, **4**:76, p. 50. Bernard, *Ann. Sci. Nat., Zool.* (8), **4**; pl. 1, 2. 1897.

The shells are enclosed in two little sacs in the substance of the mantle. The umbones are near together, apparently connected by a brown gristle resembling an abortive ligament, and are nearly over the heart. The valves are about 10 mm. long and 1 mm. wide, destitute of epidermis, prismatic, or pearly layers. There are no muscular or pallial impressions, no adductor, hinge, or teeth. The embryonic valves are retained like two tiny bubbles on the umbones. (Dall.)

TYPE in U. S. N. M. Type locality, San Diego County, California.

RANGE. Monterey Bay to False Bay, San Diego County, California.

Family CARDIIDÆ.

Genus **CARDIUM** Linnæus, 1758.

Shell ventricose, close or gaping posteriorly; umbones prominent, subcentral; radiately ribbed; margins crenulated; pallial line more or less sinuated. (Tryon. S. S. Conch.)

TYPE. *Cardium costatum* Linnæus.

DISTRIBUTION. Worldwide; from seashore to 140 fathoms.

RANGE IN TIME. Upper Silurian to Pleistocene.

Subgenus TRACHYCARDIUM Morch, 1853.

Cardium quadragenarium Conrad, 1837.

Jour. Acad. Nat. Sci. Phila., p. 230; pl. 17, fig. 5.

Shell cordate, subequilateral, ventricose, thick; ribs forty to forty-two, prominent, subangular, flattened at the sides, with a series of small tubercles, which, on the anterior side, are largest, and placed in the middle of the ribs, but elsewhere on the posterior angular margin of the ribs; umbo broad, prominent; beaks not oblique; tubercles elevated on the posterior slope; color pale yellow, with fulvus spots and zones; posterior margin direct, deeply serrate. Height, 3 inches. (Conrad.)

TYPE locality near Santa Barbara, California.

RANGE. Santa Barbara, California, to Todos Santos Bay, Lower California. In the Pliocene at Calleguas Ranch, Ventura County, and the Pleistocene at San Pedro and San Diego, California.

Subgenus CERASTODERMA Morch, 1853.

Cardium corbis Martyn, 1784.

Plate 34, figs. 1a, 1b.

Figs. Nondescript Shells, table 2, pl. 80.

Shell large, subtrigonal, ventricose, thick; umbones prominent, anterior to center; surface ornamented with about thirty-seven prominent, regular, squarish, close-set, radiating ridges, which are made more or less rugose by incremental ridges on their surface; near the posterior margin these ridges become more rounded and less prominent; between the ridges are equal, deep, canal-like grooves; margin crenulated; ligament short, external, prominent; each valve with one prominent cardinal tooth, and two laterals, one anterior and the other posterior; muscle impressions prominent, subequal. Length, 71; height, 71; diameter, 57 mm. (Arnold.)

TYPE in the Swainson Collection. Type locality, Pulo Condore.

RANGE. Nuvivak, Pribiloff, and Commander Islands to Hakodate, Japan, and to San Diego, California. In the Pleistocene at San Francisco, Monterey, San Pedro, and Santa Barbara.

Cardium ciliatum Fabricius, 1780.

Plate 19, figs. 8, 8a.

Fauna Gronl., p. 410; Binney and Gould, *Invert. Mass.,* fig. 150.

Cardium testa subcordata, fulcis elevatis subtriquetris ciliatis. Long. .19 inch. (Fabricius.)

Shell large, rather thin, a little obliquely rounded-ovate; anterior part shortest and narrowest, ends regularly rounded; beaks prominent, the points turned inward, and nearly in contact; in front of them is a narrow, heart-shaped depression; on each valve are 36, or more, three-sided sharp-edged, radiating ribs, furrows between them rounded, and regularly wrinkled by the lines of growth; epidermis yellowish brown, lax, and bristling into a stiff fringe on the sharp edge of the ribs; within straw colored, the portions covered by the mantle pearly; grooves, answering to the ribs without, are obvious within, and the edges are strongly notched. The above description is of *C. islandicum,* but is equal to *C. ciliatum.* (Gould's Invert. Mass.)

TYPE in the Copenhagen Zool. Museum. Type locality, Greenland.

RANGE. Arctic Ocean to Puget Sound and Japan. Also circumboreal.

Cardium californiense Deshayes, 1841.

Plate 2, fig. 3.

Guerin *Mag. de Zool., Moll.*, pl. 47.

Shell small, thin, ventricose, equilateral, subcircular, or a little transversely oval, yellowish white, with a thin, closely adhering, fawn-colored epidermis; posterior umbonal slope a little angular, and posterior tip a little truncated; beaks prominent, acute, incurved or slightly antrorse; surface sculptured with upward of forty radiating ribs having the presenting surface flattened, which, however, at the later stages of growth, and especially at the anterior end, are raised into delicate, arched, obtuse, crowded, somewhat imbricating, concentric ridges, only seen on careful examination; the grooves are also barred by delicate transverse folds; the ribs are not wanting, but almost disappear in front of the beaks. Interior with the central portion cream-colored, margin exterior to the pallial impression pale clay color; hinge delicate. Length, 7/8 inch. (Deshayes.)

TYPE locality, Puget Sound.

RANGE. Arctic Ocean to San Diego, California. Also Japan.

Cardium funcanum Dall, 1907.

The Nautilus, 20:112.

Shell small, plump, compact, solid for its size, covered with a smooth brown or gray periostracum usually more or less eroded; form varying from circular to slightly ovate, with rather prominent slightly prosocœlous beaks, situated a little anterior to the middle of the shell; valves moderately convex, equal and nearly equilateral, sculptured with numerous (40–58) similar, small low, flattish radial ribs separated by much narrower interspaces; these ribs are not nodulous nor keeled, they are sometimes slightly rippled by the incremental lines, and, as usual, are smaller, fainter and more crowded distally; the interspaces are rounded; near the dorsal margins on each side of the beaks there is an ill-defined narrow space which is devoid of ribs; the average number of ribs is about 50; the inner margins of the valves are crenulated; the hinge delicate and normal; the inner surface of the valves white, polished; the outer surface usually shows three or four concentric sulci due to resting-stages. Length, 38; height, 33; diameter, 18 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Juan de Fuca Strait.

RANGE. Southern Bering Sea and south to Monterey, California.

Subgenus FRAGUM Bolten, 1798.

Cardium biangulatum Sowerby, 1829.

Zool. Jour., **5**:4:367. *Conch. Ill., Cardium;* fig. 2.

Shell somewhat squarely cordate, rounded anteriorly, concavely angulated and a little produced posteriorly, radiately ribbed, ribs twenty-eight in number, the extreme posterior nine of which are narrow, small, round, the rest wider, rather flat and peculiarly obliquely or undately crenated, interstices between the ribs transversely elevately crenated; interior richly stained with purple. (Conch. Iconica.)

TYPE in British Museum, Cuming Coll. Type locality, St. Elena and Isle of Plata, W. Colombia.

RANGE. San Pedro, California, to Panama.

Subgenus TRIGONIOCARDIA Dall, 1900.

Cardium eudoxium Dall, 1916.

Proc. U. S. N. M., **52**:412.

Shell small, mottled with lighter and darker rose color, suborbicular, inflated, strongly sculptured; radial sculpture of 15 sharp angular ribs with subequal interspaces, the keel of the ribs sparsely, regularly, minutely pustular; on the posterior dorsal area are six additional smaller more pustular riblets; the interspaces in all are finely concentrically rugose; the hinge is strong; the interior margins deeply sulcate in harmony with the radial sculpture; the central part of the interior is whitish. Length, 9; height, 9; diameter, 8 mm. (Dall.)

TYPE in U. S. N. M., No. 208590. Type locality, Station 3020, Gulf of California.

RANGE. Catalina Island, California, to the Gulf of California.

Subgenus LÆVICARDIUM Swainson, 1840.

Cardium elatum Sowerby, 1833.

Proc. Zool. Soc., 1833, p. 84. *Conch. Ill., Cardium;* fig. 3.

Card. testa ovali, obliqua, lævigata, ventricosissima, flava, sulci radiantibus plurimis, medianis, præter posticis, obsoletis; area laterali, postica, anticaque lævibus, marginibus edentulis; marginibus ventralibus dentatis; epidermide tenue. Long, 4; lat. 3.5; alt. 4.5 poll. (Sowerby.)

Shell ovate, oblique, very large, radiately ridged about three and forty in number, flatly convex, obsolete toward the umbones, extreme posterior and anterior areas, smooth; citron yellow, interior white. (Conch. Iconica.)

Found in sandy mud at low water. This is the largest species of Cardium with which I am acquainted, its dimensions sometimes far exceeding those given above. (Sowerby.)

TYPE in Cuming Coll., British Museum. Type locality, Gulf of California.

RANGE. San Diego, California, to Panama. In the Pleistocene at San Pedro and San Diego, California.

Cardium substriatum Conrad, 1837.

Jour. Acad. Nat. Sci., 7:228; pl. 17, fig. 2.

Shell obliquely ovate, ventricose, thin, smooth; radiating striæ obsolete, except on the inferior part of the umbonal slope; color yellowish, variegated with brown umbo and middle of disk tinged with blue; within yellow, varied with brownish purple markings; margin finely serrate. (Conrad.)

TYPE locality, San Diego.

RANGE. Catalina Island and San Pedro, California, to Acapulco, Mexico. In the Pleistocene at Santa Barbara, San Pedro, and San Diego Well, California.

Genus **SERRIPES** Beck, 1841.

Shell subcordiform, compressed, subequilateral; surface smooth or slightly radiately striate; beaks prominent; cardinal and lateral teeth obtuse, small, almost obsolete. (Tryon. S. S. Conch.)

TYPE. *Serripes groenlandicus* Gmelin.

DISTRIBUTION. Arctic Seas.

Serripes groenlandicus Gmelin, 1792.

Plate 8, fig. 3.

Syst. Nat., 7:3232, Binney and Gould, Invert. Mass.; p. 145; fig. 454.

Cardium groenlandicum, testa cordata, lævi, antice et postice longitudinaliter subtilissime striata, margine exteriore integerrimo. Habitus Veneris sed Cardo Cardii. (Gmelin.)

Shell large, subtriangular, drab colored, with very numerous, obsolete radiating ridges; slightly gaping posteriorly, beaks slightly prominent, incurved; margins within salmon colored, center opaline. Length, 2¾ inches; height 2$\frac{3}{20}$ inches; breadth, 1½ inches. (Invert. Mass.)

TYPE in Museum Cuming. Type locality, Coast of Greenland.

RANGE. Arctic to Puget Sound. Also Atlantic and Japan.

Serripes laperousii Deshayes, 1839.

Rev. Zool. Soc. Cuvierenne, p. 360. Guerin, *Mag. de Zool., Moll.*; pl. 48, 1841.

Testa ovata-transversa subæquilatera, turgidula, transversim irregulariter striata, marginibus intergris, postice hiantibus, cadine edentulo, umbonibus oppositis, ligamento prælongo solido. (Deshayes.)

TYPE locality, "Mers de California."

RANGE. Bering Strait to Sitka, Alaska. Also Japan.

Genus **PROTOCARDIA** Beyrich, 1845.

Posterior half of the shell radiately striate, anteriorly half distantly concentrically striate. (Tryon. S. S. Conch.)

TYPE. *Cardium hillanum* Sowerby.

DISTRIBUTION. Universal.

RANGE IN TIME. Cretaceous to Pleistocene.

Protocardia centifilosa Carpenter, 1864.

Plate 34, figs. 2a, 2b, 2c, 2d.

Suppl. Rept. Brit. Assoc., p. 642, *Univ. Calif., Zool. Publ.*, **14**; pl. 20, figs. 2a-d.

Shell small, suboval, ventricose, thin; umbones central, prominent, only very slightly bent; surface sculptured by numerous fine, close-set, rounded, radiating ridges, which are made slightly rugose by numerous fine incremental lines on their surface; thin sharp teeth in each valve; pallial sinus shallow, wide; margin beautifully and sharply serrate. Long. 23; alt. 22.5; diameter, 15 mm. (Arnold.)

TYPE locality, Monterey, California.

RANGE. Bodega Bay, California, to Lower California. In the Pleistocene at San Pedro and Santa Barbara; Pliocene at Sunol, Alameda County; San Pedro, San Diego and Santa Barbara, California.

Protocardia centifilosa richardsonii Whiteaves, 1878.

Plate 2, fig. 7.

Canadian Nat., (2) **8**:469.

Shell inflated, but not quite as thick as high, inequilateral; outline transversely and ovately subcircular, length slightly exceeding the height; posterior side rather longer, and more narrowly rounded than the anterior; beaks large, elevated, incurved and approximating; placed a little in advance of the middle. Surface of the anterior and central portions of the shell marked by flattened and comparatively broad, radiating ribs, separated by narrower, deeply impressed lines, both of which are crossed by faint, concentric striæ or lines of growth. On the posterior area the radiating ribs are thin, prominent and much narrower than the flattened interspaces, and the concentric striations are developed into elevated, thin and crenulated laminar ridges. Hinge with two small cardinal and two remote lateral teeth in each valve, one of which is sublunular. Pallial line entire; inferior margin of the valves denticulated all round within. Valves touching at all points when closed; not open at either extremity. Length, 8¼; height 7½; diameter, 6 lines. (Whiteaves.)

TYPE locality, Straits of Georgia, between Race Island, and Lighthouse and Victoria Harbor, British Columbia.

RANGE. Queen Charlotte Islands, British Columbia, to San Francisco, California.

Family VESICOMYACIDÆ.

Genus **VESICOMYA** Dall, 1886.

Shell small, smooth or concentrically striate; hinge of Meiocardia but without lateral teeth; epidermis polished, umbones moderately prominent; lunule circumscribed by a groove; otherwise as in Meiocardia. (Dall.)

TYPE. *Callocardia atlantica* Smith.

DISTRIBUTION. West coast of North America.

Vesicomya lepta Dall, 1896.

Proc. U. S. N. M., **18**:17. *Bull. Comp. Zool.*, **43**; pl. 18, figs. 12, 14.

Shell large thin, earthy, white, compressed, with an olivaceous or yellowish, dehiscent epidermis, with concentric wrinkles and projecting laminæ, which in the young are somewhat regularly spaced and distant, in the adult crowded and irregular; beaks small, low, not conspicuous, moderately inflated; valves evenly arcuate below, rounded at both extremities, the anterior shorter and less high than the posterior; lunule narrow, long, bounded by an incised line; ligament external, long, set in a groove, with the escutcheon narrow, its edges elevated above the dorsal margin of the valves and obtusely keeled, extending one-half longer backward than the length of the ligament; interior smooth, or slightly radially striate, margins flattish, smooth; anterior adductor scar narrow, posterior wider, the pallial line joining it in front of its posterior edge, producing an indentation, though not a sinus, of the pallial line; hinge narrow; teeth small, compressed, three (more or less obscure) in each valve; in the right a long, strong anterior lamella, extending most of the way between the umbo and the adductor scar, with a socket around its posterior end, above this a short, small, thin, lamina, joined around the socket with a thicker lamina, obscurely wavy and extending backward; in the left valve a stout subtriangular central, joined to a thin, short, anterior lamina, with a socket under it; a short, obscure, radial tooth behind the central one; no lateral teeth in either valve, and the cardinals, as usual in this group, somewhat variable, obscure or ill-defined. Length, 53; height, 40; diameter, 23 mm. (Dall.)

TYPE in U. S. N. M., No. 126751. Type locality, Station 3009, in the Gulf of California.

RANGE. Off Tillamook, Oregon, to the Gulf of California.

Vesicomya stearnsii Dall, 1895.

Plate 11, figs. 7, 8.

Proc. U. S. N. M., **17**:693; fig. 1A. **18**:17.

Shell closely resembling *V. venusta* Dall, but larger, less inflated, the anterior end higher, the base more rounded, and the posterior end more angular and proportionally longer. Internally the flexure in the pallial line below the posterior adductor scar is more marked, and the ligament and also the posterior tooth in the right valve are conspicuously shorter. *V. stearnsii* has the same pale straw-colored epidermis and feeble incremental sculpture as *V. venusta,* but the lunule is narrower and the line circumscribing it less impressed. Length, 25; height, 17; diameter, 11.5 mm. (Dall.) Described as *callocardia.*

TYPE in U. S. N. M. Type locality, off coast of Washington near Tillamook.

RANGE. Washington to the Gulf of California.

Vesicomya ovalis Dall, 1895.

Proc. U. S. N. M., **18**:18.

Shell resembling *V. lepta,* but smaller, more oval, the posterior dorsal border more arched, the proportional inflation greater, the lunule wider, the ligament proportionally and actually longer, the epidermis more adherent and without projecting fringes or lamellæ; internally the teeth are smaller and more feeble, and the pallial line recedes less at the posterior adductor scar. Length, 36; height, 26; diameter, 16 mm. (Dall.)

TYPE in U. S. N. M., No. 106898. Type locality, U. S. Fish Commission station 3360, Gulf of Panama, in 1672 fathoms.

RANGE. Clarence Strait, Alaska, in 322 fathoms to Panama Bay, in 1672 fathoms.

Subgenus ARCHIVESICA Dall, 1908.

Vesicomya gigas Dall, 1895.

Proc. U. S. N. M., **18**:18. *Bull. Comp. Zool.*, **43**; pl. 16, fig. 9.

Shell large, rather thin, inflated, with a thin, wrinkled, olivaceous epidermis over an earthy, concentrically, irregularly striated surface; beaks low, inconspicuous; lunule and escutcheon somewhat impressed, but not limited by any distinct line; valves elongated, recalling the shape of *Modiola capax* Conrad, in a general way; the anterior side shorter and less high, the base impressed in the middle, more expanded in front and behind; dorsal margin rather evenly arched; both ends rounded; internally dentition strong, like that of *V. lepta,* but more distinctly developed; ligament short (about 20 mm.) set in a groove; interior of valve somewhat radially striate; posterior adductor scar somewhat larger, the pallial line set in below it, somewhat irregular but not forming a distinct angular

sinus; margins of valve thin, smooth. Length, 110; height, 63; diameter, 50 mm. (Dall.)

TYPE in U. S. N. M., No. 110557. Type locality, U. S. S. Albatross station 3009, off Concepcion Bay, Gulf of California.

RANGE. Off Point Sur, California, to the Gulf of California.

Family VENERIDÆ.

Genus **DOSINIA** Scopoli, 1777.

Shell orbicular, compressed, concentrically striated, pale ligament sunk; lunule deep; hinge like *Cytherea;* margins even; pallial sinus deep, angular, ascending. (Tryon. S. S. Conch.)

TYPE. *Dosinia africana* Hanley.

DISTRIBUTION. Boreal to tropical seas.

RANGE IN TIME. Cretaceous, Pleistocene.

Dosinia ponderosa Gray, 1838.

The Analyst., **8**:24:309. Sowerby, *Thes. Conch. Artemis;* pl. 140, fig. 2.

Shell nearly orbicular, rather compressed, a little broader than high, concentrically grooved, grooves almost obsolete in the middle, area of the ligament simple, lunule oblong-cordate, concavely impressed; cream color, covered with a thin, shining epidermis. (Conch. Iconica.)

TYPE in British Museum, Cuming Collection. Type locality, Gulf of California.

RANGE. San Diego, California, to Payta, Peru. In the Pleistocene at San Diego and the Pliocene at Kirker's Pass, Contra Costa County; San Fernando, Stanford University and Santa Clara County, California.

Genus **TIVELA** Link, 1807.

Shell triangular, sub-equilateral, cuneiform; three to five cardinal teeth in one valve, four to six in the other; anterior lateral tooth narrow, elongated, compressed; pallial impression with a short oblique or sometimes horizontal sinus. (Tryon. S. S. Conch.)

TYPE. *Venus matroides* Born.

DISTRIBUTION. West Indies, Mediterranean, Senegal, Cape, India, W. America.

RANGE IN TIME. Miocene, Pleistocene.

Subgenus PACHYDESMA Conrad, 1854.

Tivela stultorum Mawe, 1823.

Linn. *Syst. Conch.,* p. 37; pl. 9, fig. 7.

Shell equilateral, triangular, thick; convex-depressed; lunule undefined; posterior extremity, truncated; ligament short, very broad and

elevated; apex very prominent; beaks not oblique; color whitish, frequently rayed with brown; cardinal teeth very thick and prominent; anterior tooth elongated, thick; sinus of pallial impression angular. Length 7 inches. (Conrad.)

This species has been called *T. crassatelloides* Conrad, 1834, and the above is Conrad's description of that species.

TYPE locality, California.

RANGE. Santa Cruz, California, to Socorro Island, off the Coast of Mexico. In the Pleistocene at Santa Barbara and San Diego, California.

Genus **TRANSENNELLA** Dall, 1883.

Shell small, having the general form and coloration of *Tivela,* but a hinge with three cardinals in each valve, the middle left cardinal bified, and an elongated left lateral received into a socket in the opposite valve; the hinge has no rugosities, the lunule but not the escutcheon is defined, internal margins sharply tangentially grooved with numerous sulci; the pallial sinus angular, free, obliquely ascending.

TYPE. *Transennella conradiana* Dall, 1883.

DISTRIBUTION. Tropical and subtropical.

RANGE IN TIME. Miocene.

Transennella tantilla Gould, 1852.

Bost. Jour. Nat. Hist., **6**:406; pl. 15, fig. 10.

Shell quite small, rather solid, ovate-trigonal, inequilateral; beaks acute, surface smooth or faintly waved with distant concentric furrows; the dorsal margins are nearly straight, and meet at the apex in a right angle, but the posterior side is a fourth longer than the anterior; the anterior basal angle is well rounded, while the posterior is acute; basal margin gently curved. Color white, but the posterior third is stained deep slaty blue outside and in, the line of demarcation being quite abrupt and well defined; there is also a pencil of the same color inside, running from the beak to the anterior cicatrix; the rest of the interior is cream colored. Length, ¼; height, ⅕ inch. (Gould.)

TYPE locality, Santa Barbara, California.

RANGE. Sitka Harbor, Alaska, to Lower California.

Genus **AMIANTIS** Carpenter, 1863

Shell ovate, concentrically waved, with vernicose periostracum; lunule and a linear escutcheon defined; inner margins smooth; pallial sinus ample, anterior laterals large and strong.

TYPE. *Cytherea callosa* Conrad.

DISTRIBUTION. California.

Amiantis callosa Conrad, 1837.

Plate 56, figs. 1, 2.

Jour. Acad. Nat. Sci., 7:252. *Thes. Conch. Venus;* pl. 114, figs. 44, 45.

Shell subovate, convex-depressed, white; valves with numerous concentric flattened ribs, some of which are divided or interrupted on the anterior and posterior sides; valves irregularly thickened in the interior, except near the margins; pallial impression very distinct, and the sinus profound. Length, 2 inches. (Conrad.)

TYPE locality, near Santa Barbara, California.

RANGE. San Pedro, California, to the Gulf of Tehuantepec, Mexico. In the Pleistocene at San Pedro and San Diego, California.

Genus **PITARIA** Roemer, 1857.

Shell trigonal, plump, concentrically striate or rippled, with an inconspicuous periostracum and delicate coloration; lunule circumscribed, but the escutcheon not defined; inner margins smooth, pallial sinus ample, elongate, somewhat ascending, pointed in front; middle cardinal stout, the others slender; the posterior cardinals feebly grooved, the others entire; the cardinals of the right valve discontinuous where they touch the dorsal margin and not separated from the latter by a groove; anterior lateral adjacent, distinct; nymphs and teeth smooth; dorsal margins grooved as in *Meretrix*.

TYPE. *Venus tumens* Gmelin.

DISTRIBUTION. Widely distributed in the tropics.

Pitaria newcombiana Gabb, 1865.

Plate 57, fig. 2.

Proc. Cal. Acad. Sci., 3:189. *Proc. U. S. N. M.*, 15; pl. 23, fig. 4.

Shell thin, trigonally ventricose, polished, marked by minute concentric striæ; beaks large, subcentral; anterior end prominent, narrowly rounded, posterior a little the widest, base convex; lunule not excavated, bounded by an impressed line; color yellowish white, variously lined with brown angular lines; interior whitish; internal margin smooth; hinge teeth delicate. (Gabb.)

TYPE in Mollusca, Survey Cabinet (of California), No. 1058. Type locality, Catalina Island, California, in 120 fathoms.

RANGE. Monterey, California, to Lower California. In the Pleistocene at San Pedro and San Diego and the Pliocene at San Diego Well, California.

Genus **ANTIGONA** Schumacher, 1817.

Shell thick, ovate, smooth, sulcated, or cancellated; margins minutely crenulated; cardinal teeth 3—3; pallial sinus small, angular; ligament prominent; lunule distinct. (Tryon. S. S. Conch.)

TYPE. *Antigona lamellaris* Schumacher, 1817.
DISTRIBUTION. World-wide.
RANGE IN TIME. Oolite, Pleistocene.

SECTION VENTRICOLA Roemer, 1857.

Antigona fordi Yates, 1890.

Plate 55, fig. 3.

Santa Barbara Soc. Nat. Hist., Bull., **2**:46; pl. 1, figs. 1–5.

Shell thick, solid, ovate, tumid, truncated at point, exterior light brown; beaks projecting to front of the shell, much elevated and curved, making more than half a turn forward and inward; lunule rough, much depressed, heart-shaped, bounded by an impressed line; ligament not large, but nearly hidden in the depression between the elevated beaks; surface with concentric rounded ridges and grooves, marked on the surface by minute concentric laminæ, about one-third of a millimeter apart, forming a chalky covering to the shell; the entire surface of the shell is further marked by fine, but somewhat irregular radiating lines and corresponding depressions a little less than a millimeter apart; these lines are more distinctly shown on the anterior portion of the shell; margins finely crenulated; young shells are of a dirty yellowish white, and mature shells which have become divested of the chalky exterior are of a yellowish brown color, and together with the young shells are marked with four radiating rows of chocolate colored blotches. Length, 2⅜; height, 2⅜; diameter, 2 inches. (Yates.)

TYPE locality, Santa Barbara, California.
RANGE. Monterey, California, to Lower California. Panama.

Genus **SAXIDOMUS** Conrad, 1837.

Shell equivalve, gaping posteriorly; hinge with from four to five compressed cardinal teeth in the right valve; in the left valve, four; muscular impressions two, large, rounded; pallial impression with a profound sinus.

TYPE. *Saxidomus nuttallii* Conrad.
DISTRIBUTION. California.
RANGE IN TIME. Pleistocene, Pliocene, Miocene.

Saxidomus nuttallii Conrad, 1837.

Plate 35, fig. 2.

Jour. Acad. Nat. Sci. Phila., **7**:249; pl. 19, fig. 12.

Shell suboval, disk rough, with concentric striæ, elevated on the posterior slope; posterior extremity truncated; color white, with brown spots and stripes about the umbo and ligament. Length, 2 inches. (Conrad.)

TYPE in *Acad. Nat. Sci. Phila.* Type locality, San Diego, California.
RANGE. Bolinas Bay to San Diego, California.

Saxidomus giganteus Deshayes, 1839.

Revue Zool. Soc. Cuvierienne, p. 350. Guerin, *Mag. de Zool. Moll.,* 1841, pl. 43.

Shell solid, broad, and heavy; the young are yellowish white; the adult attains a length of 130 mm., and the concentric sculpture is much less pronounced than in *S. nuttallii.* The exterior is sometimes fulvus, but the interior is always white. Specimens which have nestled in rock crevices are usually stunted and distorted. (Dall.)

TYPE locality, not known.

RANGE. Aleutian Islands, from Attu eastward and south to Monterey, California.

Saxidomus giganteus brevis Dall, 1916.

Proc. U. S. N. M., 52:413.

Shell short, subtriangular, small in comparison with the type and much less elongated. Length, 60; height, 50; diameter, 33 mm. (Dall.)

TYPE in U. S. N. M., No. 204020. Type locality, Mole Harbor, Admiralty Islands, Alaska.

RANGE. Admiralty Islands, Alaska to Tacoma, Washington.

Genus **CHIONE** Megerle, 1811.

Shell oval, triangular or subcordiform; margins finely crenulated; hinge narrow, solid, with three teeth in the right valve and two in the left, the anterior tooth longest; ligament narrow; pallial sinus shallow. Mantle-margins folded and dentate; siphons short, unequal, the branchial doubly cirrated, the anal ciliated. (Tryon. S. S. Conch.)

TYPE. *Venus cancellata* Linn.

DISTRIBUTION. World wide.

RANGE IN TIME. Pleistocene, Pliocene, Miocene.

Chione fluctifraga Sowerby, 1853.

Plate 39, fig. 3.

Thes. Conch., Venus, p. 712; pl. 154, figs. 42, 43.

V. testa ponderosa, suboblique rotundata, alba, concentrice purpureo distanter fasciata, costellis radiantibus postice et antice majoribus et costellis interruptim fluctuatis intersecta; latere postico subangulato; margine dorsali rotundato, subarcuato, maculato, paululum depresso; margine ventrali intus crenulato, purpureo. (Sowerby.)

Named as above from the character of the concentric ridges, which are fluctuated and as it were broken up on the surface; the shell is solid, rounded, and nearly white, with several bands of livid colour; the inside is purple at the border, and about the posterior impressions. Length, 25; height, 21; diameter, 15 mm. (Sowerby.)

TYPE locality, Australia.

RANGE. San Pedro, California, to the Gulf of California. Pleistocene, Santa Barbara to San Diego, California.

Chione undatella Sowerby, 1853.

Plate 55, fig. 2.

Proc. Zool. Soc., p. 22. *Thes. Conch., Venus*, pl. 153, fig. 22.

V. testa rotundato-elliptica, crassa, albida, fusca maculata, punctata, et undatim picta; costellis radiantibus cinfertis, aliisque decussantibus, undulatis, sublamellosis; latere antico breviore, postico subdeclivi; marginibus depressis; margine ventrali rotundato, intus crenulato. Long. 1.6; lat. 1; alt. 1.5 poll. (Sowerby.)

Shell ovate, rather compressed, bluish white, lineally waved and blotched with violet brown, radiately regularly ridged, ridges obsolete toward the margin, concentrically ridged, ridges waved, close-set and strongly toward the margin, ligamentary area rather broadly excavated, conspicuously striped. (Conch. Iconica.)

TYPE in Museum Cuming. Type locality, Gulf of California.

RANGE. San Pedro, California, to Guayaquil.

Chione succincta Valenciennes, 1832.

Humboldt and Bonpland, *Obs. Zool.*, p. 219; pl. 48; figs. 1, a–c.

Shell of medium size, thick, subcordiform; surface ornamented by several about equidistant slightly reflexed, low concentric frills and numerous rounded, radiating ridges, most prominent on the middle of the shell, which increase by intercalation and become flattened and less prominent as the periphery is approached; lunule prominent, ornamented by both incremental laminæ and rounded, radiating ridges; hinge narrow; two prominent cardinal teeth in each valve; pallial sinus very shallow; margin crenulated. Length, 55; height, 50; diameter, 32. (Arnold.)

TYPE locality, not known to the writer.

RANGE. San Pedro, California, to Panama. In the Pleistocene at Santa Barbara, San Pedro, and San Diego; in the Pliocene at Seven Mile Beach, San Mateo County, and San Fernando, California; in the Miocene in Oregon, and at Martinez, San Pablo, Griswold's in San Benito County, Foxen's in Santa Barbara County, and Santa Monica, California.

Genus **VENUS** (Linnæus) Lamarck, 1799.

Shell thick, ovate, smooth, sulcated or cancellated; margins minutely crenulated; cardinal teeth 3—3; pallial sinus small, angular; ligament prominent; lunule distinct. (Tryon. S. S. Conch.)

TYPE. *Venus mercenaria* Linn.

DISTRIBUTION. World-wide.

RANGE IN TIME. Oolite, Pleistocene.

Venus kennicottii Dall, 1871.

Plate 14, fig. 7.

Amer. Jour. Conch., 7:147; pl. 16, fig. 1.

Shell cuneiform, dark ferruginous brown, ornamented with fine concentric, slightly elevated lamellæ. Valves rather inflated, thick; umbones prominent, rounded; within the anterior third; anterior end rounded from below to the lunule, which is broad, cordiform and impressed, bounded by a deeply incised line. Extreme anterior end of the valves rather pinched together. Anterior ventral margin arcuated. Posterior end thick, rather produced and pointed. Posterior dorsal side roundly arched from the umbones to the end; two obsolete carinæ pass from the umbones on each side posteriorly, the inner pair forming the boundary of the ligamentary area; inner posterior and ventral margin finely crenulated. Hinge line strongly arched behind. Dental area broad, teeth strong. Posterior dental process rugose. Muscular impressions large; pallial sinus short, sharply angulated. Sculpture of fine concentric lamellæ, slightly elevated, more so on the anterior end; more distant on the umbones, thickly crowded near the margin especially anteriorly. Lines of growth prominent at intervals. Lamellæ passing over the ligamentary area and lunule. Interior white; the dark brown of the exterior may be a stain but looks natural. Length, 2.64; height, 2.1; diameter, 1.56 inches. (Dall.)

TYPE in U. S. N. M. Type locality, Neah Bay, Washington.

RANGE. Neah Bay, Washington, to Mendocino County, California.

Genus **MARCIA** H. & A. Adams.

Marcia kennerlyi (Cpr.) Reeve, 1863.

Plate 8, fig. 4.

Conch. Iconica, Venus, sp. 41.

Shell oblong, somewhat square, dull opaque white, concentrically plicately ribbed, ribs close-set, a little recurved, rather irregular, lunule and ligamentary area narrow. (Reeve.)

TYPE in Cuming Coll., British Museum. Type locality, Puget Sound.

RANGE. Kodiak Island, Alaska, to Santa Barbara Islands, California.

SECTION VENERELLA Cossmann, 1886.

Marcia subdiaphana Carpenter, 1864.

Plate 38, fig. 1, and plate 33, fig. 3.

Brit. Assoc. Rep., 640. *Proc. U. S. N. M.*, **14**; pl. 7, figs. 5, 6.

Hinge normal, very thin, ashy. (Carpenter.)

Shell of medium size, oval, transverse, inequilateral, ventricose, rather thin; beaks small, incurved; anterior extremity quite sharply angulated about the middle of the shell; posterior extremity much longer and wider than the anterior and very evenly rounded, projecting furthest a little

below the middle; ventral margin evenly arcuate; surface sculptured by numerous fine, regular concentric incremental lines; neither lunule nor escutcheon, but a faint lunular circumscribing line in front of umbo; three prominent sharp, cardinal teeth in each valve, the anterior one being narrower and longer than the other two; external ligamental groove long, narrow; pallial sinus cuneiform, rather deep. Length, 43; height, 34; diameter, 26 mm. (Arnold.)

TYPE locality, Puget Sound.

RANGE. Sannakh Islands, Alaska, to Santa Barbara Islands and San Pedro, California.

Genus **PAPHIA** Bolten, 1798.

Shell trigonal, thick, compressed, closed; ligament internal, in a deep central pit; a minute anterior hinge tooth, and 1—1 lateral teeth in each valve; muscular scars deep; pallial sinus small. (Tryon. S. S. Conch.)

TYPE. *Paphia ala-papilionis* Bolten, 1798.

DISTRIBUTION. West Indies, Mediterranean, Crimea, India, New Zealand, Chile, California.

RANGE IN TIME. Miocene, Pleistocene.

Subgenus PROTOTHACA Dall, 1902.

SECTION CALLITHACA Dall, 1902.

Paphia tenerrima Carpenter, 1865.

Plate 30, figs. 1a, 1b.

Proc. Zool. Soc. 1856, p. 200, *Univ. Cal. Zool. Publ.*, **14**; pl. 22.

T. tenerrima, albido-fusca, obovali, compressa; marginibus æqualiter excurvatis; striulis radiantibus creberrimis, antice et postice fortioribus, et lirulis acutis concentricis, plus minusve dentantibus, eleganter ornata; lunula vix stria majore definita; intus, dent. card. iii. radiantibus, quorum valva in altera ii. altera i. bifidi sunt; sinu pallii maximo, elongato, lateribus suberectic, parum divergentibus, apice cicatr. ant. contiguo, subrotundato; margine vix crenulato. Long. 94; lat. 1.13; alt. 38. (Carpenter.)

TYPE in Boston Soc. Type locality, Panama.

RANGE. Puget Sound to San Quentin Bay, Lower California. Carpenter reports this from Panama, Coll. Col. Jewett. In the Pliocene at Santa Barbara and the Pleistocene at Santa Barbara, San Diego and Ventura, California.

Paphia staminea Conrad, 1837.

Plate 35, figs. 1a, 1b.

Jour. Acad. Nat. Sci. Phila., **7**:250; pl. 19, fig. 15.

Shell suboval or suborbicular, convex, with numerous crowded radiating striæ, and finer concentric lines, most distinct on the anterior side;

posterior extremity direct; ligament margin nearly parallel with the base; color variegated with yellowish and brown angular spots; cardinal teeth compressed; sinus of pallial impression profound. Length, 1½ inches. (Conrad.)

TYPE in Phila. Acad. Sci. Type locality, California.

RANGE. Commander and Aleutian Islands to Puget Sound and Socorro Island. Also Japan. In the Pleistocene at Santa Barbara and San Diego; in the Pliocene at Santa Rosa, Twelve Mile House in San Mateo County, Kirker's Pass in Contra Costa County, San Fernando and San Diego; in the Miocene west of San Jose, Foxen, and in Santa Barbara County, California.

Paphia staminea ruderata Deshayes, 1853.

Cat. Conch. Brit. Mus., **1**:136. *Conch. Iconica,* **14**; pl. 25, fig. 130.

Shell broadly obliquely ovate, dead-white, finely radiately ridged, ridges in pairs, concentrically plicated, plates very irregular, rudely lamellated on the posterior side, no lunule. (Conch. Iconica.)

TYPE in Brit. Museum. Type locality, California.

RANGE. Southern Bering Sea to Lobitas, California.

Paphia staminea petitii Deshayes, 1839.

Revue Zool. Soc. Cuvierienne, p. 359. Guerin *Mag. de Zool. Moll.,* 1841, pl. 39.

Yellowish, chalky white or dull gray color without maculations, sculpture markedly separated into areas. (Dall.)

TYPE locality, Columbia River.

RANGE. Aleutian Islands to San Quentin Bay, Lower California.

Paphia staminea lacineata Carpenter, 1864.

Suppl. Rep. Brit. Assoc., p. 641. Arnold, *Pal. San Pedro;* pl. 14, fig. 5.

This extremely elegant variety is evenly reticulated by concentric and radial sculpture, and derives its individuality from the development of small prirkles or spines at each intersection. When these spines are worn off it cannot be separated from the variety *petitii,* but with them it is unmistakable. (Dall.)

TYPE locality, Monterey or San Diego.

RANGE. Unalaska to San Diego, California. In the Pleistocene at San Pedro, California.

Paphia staminea orbella Carpenter, 1864.

Plate 33, fig. 6.

Suppl. Rep. Brit. Assoc., p. 641. *Univ. Cal. Zool. Publ.,* **14**; pl. 19, fig. 6.

This variety comprises those specimens which have nestled in the borings of the large *Pholas* of the coast, especially at Monterey, and have

been obliged to grow into an abnormally swollen and tumid shape. They are usualy chalky and of a gray tint. (Dall.)

TYPE locality, not given.

RANGE. Kodiak Island, Alaska, to San Diego, California.

Paphia staminea spatiosa Dall, 1916.

Plate 9, fig. 1.

Proc. U. S. N. M., **52**:413.

Shell large, heavy, rounded quadrate, inequilateral, the beaks behind the anterior end 18 mm.; yellowish or brownish white without markings; sculpture of simple, similar, narrow radial ribs with narrower interspaces, except on the posterior dorsal area where there are a few wider ribs with deeper interspaces; inner margins finely crenulate; pallial sinus deep, narrow, nearly horizontal. Length, 80; height, 67; diameter, 50 mm. (Dall.)

TYPE in U. S. N. M., No. 151562. Type locality, Coos Bay, Oregon.

RANGE. Puget Sound to Anaheim Bay, California.

Genus **LIOCYMA** Dall, 1870.

Shell trigonal or elongate-ovate, small, thin, smooth; furnished with concentric undulations and occasionally fine radiating lines; provided with a polished epidermis; pallial sinus small, rounded triangular; hinge teeth three in each valve, divaricate; middle tooth largest, grooved on the upper edge. Lunule faint, no areola ligament set in below the exterior surface. (Dall.)

TYPE. *Venus fluctuosa* Gould.

DISTRIBUTION. From Japan and eastern Siberia to British Columbia.

Liocyma beckii Dall, 1870.

Proc. Boston Soc. Nat. Hist., **13**:257. *Amer. Jour. Conch.*, 7; pl. 14, fig. 7.

Distinguished by its rounded umbones and moderate tumidity, by the angulated hinge margin, short, anterior extremity, less arcuated ventral margin and small size. The area occupied by the hinge teeth is shorter and wider than in *L. fluctuosa,* from which its trigonal shape immediately distinguishes it. Over one hundred specimens were collected at Plover Bay, E. Siberia, agreeing with each other and differing from young of *L. fluctuosa.* The pallial line is very broad. Lat. 0.4; long. 0.56; alt. 0.54 poll. (Dall.)

TYPE in U. S. N. M. Type locality, Plover Bay, E. Siberia.

RANGE. Arctic Ocean, Bering Sea. Also Japan.

Liocyma scammoni Dall, 1871.

Plate 6, fig. 7.

Amer. Jour. Conch., 7:145; pl. 14, fig. 9.

Shell most resembling *L. fluctuosa,* but less compressed, much stouter and thicker. Epidermis of a deep yellow brown, instead of waxen; shape more trigonal with posterior ventral margin more produced; umbones dark umber brown, ligament longer stouter and much more prominent; lunule almost obsolete, with waves continued over it instead of smooth. Concentric sculpture in waves, not separated by grooves as in *L. fluctuosa,* of the same size, but further apart, more irregular and rounded or sharp instead of flattened. Hinge line broader, teeth larger and much stouter than in any other species; pallial sinus shallower and rounder, and muscular impressions proportionately larger than in any other form of the genus. Long. 8; alt. 0.64; diameter, 0.36 inch. (Dall).

Type in U. S. N. M. Type locality, Port Simpson, British Columbia.

Range. Known only from the type locality.

Liocyma viridis Dall, 1871.

Plate 1, fig. 3.

Amer. Jour. Conch., 7:146; pl. 14, fig. 8.

Shell of a beautiful pea-green, covered with a beautifully polished epidermis; sculpture of very fine rather sharp concentric waves, very regular in outline. Epidermis between the waves raised in minute bubble-like globules. Numerous faint rather distant impressed lines, not striæ or grooves, radiating from the umbones, which are rather small and acute. Shell thin but not compressed, waves flattened. Hinge line very narrow, teeth slender but distinct, very close together. Umbones in the anterior third. Ventral margin produced and greatly arched. Anterior end rather pointed, short. Pallial sinus small, sharply angulated. Muscular scars small. Hinge line very slightly arched. Length, 1; height, 0.66; diameter, 0.35 inch. (Dall.)

Type in U. S. N. M. Type locality, Arctic Ocean.

Range. Arctic Sea southward to Japan and east to Kodiak Island, Alaska.

Genus **VENERUPIS** Lamarck, 1818.

Shell elongated, moderately tumid, surface rugosely striated and ribbed, distinctly gaping posteriorly; hinge in the right valve with two cardinal teeth, and a third very small, but usually obsolete, anterior; the middle one is prominent, curved as in *Petricola;* the posterior is longitudinally lamellar, low and bifurcate; in the left valve are three distant and very unequal cardinal teeth; the middle one is similarly projecting as the corresponding tooth in the other valve. (Tryon. S. S. Conch.)

TYPE. *Venus irus* Linnæus.
DISTRIBUTION. Europe, Pacific.
RANGE IN TIME. Jurassic, Pleistocene.

Venerupis lamellifera Conrad, 1837.
Plate 39, fig. 8.

Jour. Acad. Nat. Sci., Phila., **7**:251; pl. 19, fig. 19.

Shell suboval, compressed; disks with about eight lamelliform concentric slightly reflexed ribs, and very obscure radiating sulci; posterior extremity widely truncated; color white; pallial impression with a profound sinus. Living in holes in the rocks. (Conrad.)

TYPE locality, Monterey, California.
RANGE. Monterey to San Diego, California.

Genus **GEMMA** Deshayes, 1853.

Shell rounded, subtriangular, subequilateral, smooth, margins crenulated within; hinge short and narrow; three teeth in the left valve, the middle one conical arcuated; two divergent teeth and an intermediate pit in the right valve; pallial impression marginal, with a narrow deep sinus. (Tryon. S. S. Conch.)

TYPE. *Venus gemma* Totten, 1834.
DISTRIBUTION. United States.

Gemma gemma Totten, 1834.

Amer. Jour. Sci., **26**:367; fig. 2.

Shell small, nearly orbicular, beaks nearly central, slightly elevated; generally eroded. No defined lunule in front of them; surface shining, with minute, concentric, crowded furrows; anterior portion, and mostly the base, white or tinged with rose color; posterior and upper portion reddish purple; within white, except posteriorly, where it has the purple color of the outside; muscular and pallial impressions distinctly marked, the latter with an acute sinus; teeth divergent, the middle one in each valve stout and triangular, the anterior tooth of the right, and the posterior one of the left valve thin, and not easily distinguished; inner margin crenulated. Length, $\frac{3}{20}$ of an inch; height, $\frac{1}{8}$ of an inch; breadth, $\frac{1}{16}$ of an inch. (Binney and Gould, Invert. Mass.)

TYPE locality, New England.
RANGE. Puget Sound to San Francisco, introduced. Also Atlantic.

Genus **PSEPHIDIA** Dall, 1902.

Shell small, vermiform, polished, with faint concentric sculpture; beaks not prominent; valves inequilateral, with a narrow, feebly defined lunule

and no escutcheon; inner margins not crenate; pallial sinus distinct, angular; hinge with three delicate entire cardinals in each valve, but no laterals. (Dall.)

TYPE. *Chione lordi* Baird, 1863.

DISTRIBUTION. Pacific coast of North America from Bering Sea to Lower California.

RANGE IN TIME. Pleistocene, Pliocene.

Psephidia lordi Baird, 1863.

Plate 6, fig. 3.

Proc. Zool. Soc., p. 69; pl. 2, fig. 10.

Shell small, of an ovate-triangular shape, a smooth shining appearance, and a light olive color. The surface is concentrically marked with slight grooves. The beaks are prominent and very shining. Internally the surface is white, the margins of the shell very finely crenulate, and the pallial impression short and blunt. (Baird.)

TYPE in Brit. Mus. Type locality, Esquimalt Harbor, Vancouver Island, British Columbia.

RANGE. Unalaska, Alaska, to Coronado Islands, Lower California.

Psephidia ovalis Dall, 1902.

Plate 34, fig. 4.

Proc. U. S. N. M., **26**:407; pl. 16, fig. 4.

Shell small, white, polished, oval, subcompressed; surface with obsolete concentric threads near the anterior base, but over most of the disk smooth; beaks small and very low, at about the anterior third of the length; lunule elongated, extremely narrow, nearly as long as the anterior dorsal slope; escutcheon linear or none; interior white, the pallial sinus moderate, pointed; internal margin delicately striated; hinge well developed, like that of *P. lordi,* with three entire cardinals and no anterior lateral tooth. Length 8.5; height, 6.5; diameter, 3 mm. (Dall.)

TYPE in U. S. N. M. Type locality, north side of Catalina Island, California.

RANGE. St. Paul Island, Bering Sea, to San Diego, California.

Psephidia cymata Dall, 1913.

Plate 22, fig. 3.

Proc. U. S. N. M., **45**:593.

Shell small, white, solid, rounded triangular, with inconspicuous, somewhat anterior beaks, the lunule and escutcheon very feebly indicated; surface with fine concentric but not perfectly regular low threadlike sculp-

ture; periostracum yellowish, rather coarse; hinge of the genus; inner margins smooth, interior disk polished, the pallial sinus small, ascending, the inner extreme bluntly rounded; muscular impressions distinct, ligament small and weak. Length, 6; height, 5.5; diameter, 2.5 mm. (Dall.)

TYPE in U. S. N. M., No. 266158. Type locality, near Cerros Island, Lower California.

RANGE. Santa Barbara Islands, California, to the Gulf of California.

Psephidia salmonea Carpenter, 1864.

Brit. Assoc. Rept. 1864, p. 641. *Univ. Cal. Zool. Publ.*, **14**; pl. 25, fig. 3.

Shell very small, ovate trigonal, inequilateral; posterior end evenly rounded; posterior dorsal margin rounded; in other ways resembles *P. tantilla.* (Carpenter.)

TYPE in Brit. Museum. Type locality, Farallon Islands, California.

RANGE. Catalina Island to San Diego, California.

Psephidia brunnea Dall, 1916.

Proc. U. S. N. M., **52**:413.

Shell small, rounded triangular, moderately convex, brown, pale yellow with zigzag brown reticulation, or even pale yellowish with only traces of red or brown on the hingeline; surface apparently smooth, with a dull silky effect, which on magnification is seen to be due to minute concentric close-set threadlike sculpture; beaks prominent, prodissoconch minute but distinct; hinge normal, strong; inner margins entire, pallial sinus shallow, irregular. Length, 3.7; height, 3; diameter, 2 mm. (Dall.)

TYPE in U. S. N. M. No. 109469. Type locality, Catalina Island, California.

RANGE. Monterey, California, to San Hipolito Point, Lower California.

Family PETRICOLIDÆ.

Genus **PETRICOLA** Lamarck, 1801.

Shell oval or elongated, thin, tumid, anterior side short; hinge with three teeth in each valve, the external often obsolete; pallial sinus deep. (Tryon. S. S. Conch.)

TYPE. *Venus lapicida* Chemnitz and Gmelin.

DISTRIBUTION. United States, France, Red Sea, India, New Zealand, Pacific, West America (Sitka to Peru).

RANGE IN TIME. Cretaceous, Pleistocene.

Petricola carditoides Conrad, 1837.

Plate 34, figs. 6a, 6b.

Jour. Acad. Nat. Sci. Phila., **7**:255; pl. 20, fig. 8.

Shell oblong-oval; disks with minute radiating lines; ligament margin straight, parallel with the basal margin; posterior extremity direct; cardinal teeth prominent. Length, 1½ inch. (Conrad.)

TYPE in Phila. Acad. Nat. Sci. Type locality, near Santa Barbara, California.

RANGE. Vancouver Island to Lower California.

Petricola denticulata Sowerby, 1834.

Proc. Zool. Soc., p. 46. *Conch. Iconica*, **19**; pl. 11, figs. 9 a, b.

Shell Pholas-shaped, elongated, anteriorly gaping, acuminated, sloped upward and downward at the margins, rayed with depressed crenated ribs; posteriorly radiately striated, rather acuminated; chestnut within, at the ends and near the ventral margin. Long. 1.1; lat. 0.6; alt. 0.6 poll. (Conch. Iconica.)

TYPE locality, Payta, Peru.

RANGE. California to Peru.

Family COOPERELLIDÆ.

Genus **COOPERELLA** Carpenter, 1864.

Cartilage subinternal, the ligament contiguous to it, the cardinal teeth simple or one of them bifid. (Tryon. S. S. Conch.)

TYPE. *Œdalia subdiaphana* Carpenter, 1864.

DISTRIBUTION. West coast of North America from Queen Charlotte Islands, British Columbia, to Gulf of California.

Cooperella subdiaphana Carpenter, 1864.

Jour. de Conch., **12**:134, 1865. *Brit. Assoc. Rept.*, 1864, p. 639.

Shell small, subquadrangular, subequilateral, convex, very thin and fragile; posterior extremity evenly rounded; anterior extremity rounded near the base; surface smooth except for incremental lines; beaks slightly raised, sharp, prominent; two narrow, tall, sharp, bifid teeth in left valve, three in right; pallial sinus very large. Length, 12; height, 9; diameter, 6 mm. (Arnold.)

TYPE locality, San Diego, California.

RANGE. Queen Charlotte Islands, British Columbia, to the Gulf of California.

Family TELLINIDÆ.

Genus **TELLINA** (L.) Lamarck, 1799.

Shell slightly inequivalve, compressed, rounded in front, angular and slightly folded posteriorly, umbones, subcentral; teeth 2.2, laterals 1.1,

most distinct in the right valve; pallial sinus very wide and deep; ligament external, prominent. (Tryon. S. S. Conch.)

TYPE. *Tellina virgata* Linn.

DISTRIBUTION. In all seas, especially the Indian Ocean; most abundant and highly colored in the tropics.

Tellina idæ Dall, 1891.

Plate 14, fig. 4.

Proc. U. S. N. M., **14**, pl. 133; pl. 6, fig. 3.

Shell ovate-triangular, moderately elongate, white, compressed; exterior of the right valve slightly flatter, and with more prominent sculpture than the left valve; beaks small, pointed, prominent, laterally compressed, adjacent to each other; anterior part of the shell slightly longer than the part posterior to the beaks, evenly and regularly oval, the dorsal and basal curves almost identical; posterior dorsal slope steeper, rectilinear, obliquely truncate at its termination, the basal curve (behind the perpendicular from the beaks) similar to its anterior part as far as the flexure, which is narrow but well marked, its basal end moderately incurved; behind it rises to a strong ridge the end of which forms a rostral projection, behind which, in the right valve, is a deeply impressed line a little in advance of the posterior dorsal margin, which is strongly compressed; on the left valve there are two lines with a narrow impressed area between them, above which the dorsal margin is swollen; in front of the beaks is a narrow, acute, deeply excavated, short lunule; behind the beaks is a large, narrow, still more excavated escutcheon, most of which is excavated from the left valve, which falls short of the right valve a little; the ligament is sunken in and about half as long as the escutcheon; it is quite invisible on a lateral view of the shell; the left valve is regularly, sharply, closely, concentrically grooved, and both are obsoletely, finely, radiately striate; the margin between the impressed area of the left valve and the escutcheon is more finely grooved than the rest and has a (somewhat irregularly) denticulate dorsal edge; the right valve has the concentric sculpture more distant and ventrally, shows distinctly elevated narrow lines with wider interspaces regularly disposed, and also bears denticulations on its posterior dorsal margin; the umbones are nearly smooth; the shell gapes but little, chiefly at the end of the rostrum; internally the surface of the valves is smooth, the muscular and pallial impressions are brilliantly polished; besides the usual marks, in the specimen under examination there are, near the posterior ventral angle of the pallial sinus, two small circular impressions and some obscure and irregular markings at the entrance of the sinus, all due, doubtless, to attachments of the mantle and probably inconstant or variable in different individuals; the interior part of the pallial sinus nearly reaches the scar of the anterior adductor, and

nearly the whole of the basal part is coincident with the line of the basal attachment of the mantle; the hinge plate is broad and subtriangular quite strong, bearing one prominent grooved tooth between two channels; behind the posterior channel, in the left valve, is a much narrower, obscure, and little-raised tooth; the corresponding second tooth in the right valve is anterior and similarly obscure; the left valve is destitute of lateral teeth, but in the right valve there is a short, strong, elevated, subtriangular, anterior lateral close to the anterior cardinal, and a more distant and feeble posterior lateral over the posterior adductor scar.

Length, 48; height, 28.5; diameter, 8.5 mm. of which 5 mm. is comprised in the left valve. (Dall.)

TYPE in U. S. N. M. Type locality, Long Beach, California.

RANGE. Santa Barbara Islands to San Diego. In the Pleistocene at Santa Monica and San Pedro.

Subgenus ARCOPAGIA Leach, 1827.

SECTION MERISCA Dall, 1900.

Tellina lamellata Carpenter, 1857.

Mazatlan Cat., p. 37, No. 58.

A beautiful little shell, very flat, thin, white, transparent; cardinal and lateral teeth moderately strong; spaces between the lamellæ smooth; outline oval very regular except where the umbos project; flexure wanting. It might have been the young of *T. lira,* but for the entire absence of the stout umbonal ridge of that species. Length, 1; height, .13. (Carpenter.)

TYPE locality, Mazatlan, Mexico.

RANGE. San Diego, California, to Mazatlan, Mexico.

Tellina declivis Sowerby, 1868.

Conch. Iconica, 17, sp. 261; pl. 44, fig. 261.

Shell white, smooth, inflated, subtrigonal; anterior side inflated, dorsal margin sloped, rather convex, and rounded, posterior side cuneate, subcompressed, radiately angular, slightly rostrated, dorsal margin much sloped, end truncated, acuminated below, margin excavated before the angle, umbones subcentral, elevated, obtuse. (Conch. Iconica.)

TYPE in Museum Hanley. Type locality not given.

RANGE. Catalina Island, California, to Panama.

Subgenus MOERELLA Fischer, 1887.

Tellina salmonea Carpenter, 1864.

Plate 44, figs. 3a, 3b.

Suppl. Rep. Brit. Assoc., p. 639. Conch. Iconica, 17; pl. 29, fig. 155.

Shell small, solid, polished, subcuneated, equivalve, very little flexuous, whitish, salmon tinted within; posterior side very short, with dorsal

margin sloping, end truncated, ventral margin obtusely angulated at the end; anterior side oblong, ventral margin rounded, dorsal margin sloping, umbones small, ligament short, hinge margin thick, with lateral teeth short, cardinal teeth small. (Conch. Iconica.)

TYPE in Museum Taylor. Type locality, Vancouver Island, British Columbia.

RANGE. Aleutian Islands to San Pedro, California.

Tellina meropsis Dall, 1900.

Proc. U. S. N. M., **23**:317; pl. 3, fig. 1.

Shell small, white, solid, subequilateral, rather swollen, slightly flexed behind, with a rather bluntly pointed posterior end; surface finely concentrically closely striate, with obscure radial striulations and a papery periostracum, which sometimes has an iridescent effect and is often dehiscent; beaks low and pointed; interior white, sometimes with a pale yellow suffusion; hinge normal, the left anterior lateral small but distinct; pallial sinus large, separated from the anterior adductor scar only by the feeble slightly elevated ray. Length, 15; height, 11.5; diameter, 6.4 mm. (Dall.)

TYPE in U. S. N. M., No. 123410. Type locality, San Diego, California.

RANGE. San Diego, California, to the Gulf of California.

Subgenus ANGULUS Megerle, 1811.

Tellina carpenteri Dall, 1900.

Plate 44, figs. 10a, 10b, and plate 29, fig. 2.

Brit. Assoc. Rept., E., p. 235.

A. testa forma A. *obtuso* simili, sed costa interna omnino carent, valde inæquilaterali, solidiore, nitente, rosaceo et flavido subtratim eleganter variegata; striis incrementi concentricis, postice extantioribus; umbonibus postice flectentibus, obtusis; parte antica prolongata regularites excurvata; marginibus dorsali et ventrali subparallelis, subrectis; parte postica curtiore, subangulata; intus, dent. card. utraque valva ii. minutis, quorum alter bifidus; v. dext. dent. lat. ant. curto, satis extante, post nullo; nymphis curtis, latis, parum concavis, subito sectis, valvis postea subalatis; sinu pallii fere cictr. ant. tenus porrecto. Long. .72; lat. .42; alt. 15. (Carpenter.)

Tellina carpenteri was given by Dall as a new name for *T. variegata* Carpenter. I have used Carpenter's description.

TYPE locality, Neah Bay.

RANGE. Forrester Island, Alaska, to the Gulf of California.

Tellina panamænsis Dall, 1900.

Proc. U. S. N. M., **23**:319, pl. 3, fig. 3.

Shell small, thin, ivory white, polished, rather compressed, flexuous behind, the anterior end much the longer, produced, and rounded, posterior end with the ligament rather deeply inset, margin obliquely descending to a rather blunt point; surface smooth, or marked only by incremental lines, except near the basal margin, where there are a few incised lines with wider interspaces, not quite in harmony with the lines of growth; posterior dorsal area minutely concentrically rippled; hinge normal, delicate; pallial sinus large, not reaching the adductor, mostly confluent below; the elevated ray absent or obsolete. Length, 9; height, 5.25; diameter, 2.5 mm. (Dall.)

TYPE in U. S. N. M., No. 108557. Type locality, Panama Bay, U. S. Fish Com. Station 2799.

RANGE. Catalina Island, California, to Panama.

Tellina modesta Carpenter, 1864.

Suppl. Rep. Brit. Assoc., p. 639. *Proc. Acad. Nat. Sci. Phila.*, 1865, p. 54.

A. t. "A *tenero*," Sayii, simillima; sed callosutate conspicua interna antica ab umbonibus decurrente, sinum pallii et cicatricem adductorem utraque valva separante; parva, subdiaphana, nitidissima, donaciformi; epidermide cornea tenuissima, striulis incrementi, plus minusve conspicuis, induta; margine antico dorsali subplanato; umbonibus extantibus; area postica truncata, haud acute definita; margine subplanata; intus, dentibus cardinalibus utraque valva ii., quorum alternati bifidi; va; va sinistrali lat. antico curto, extante, contiguo, posticis nullii usque ad callosutatem porrecto; nymphis paulum concavis. Long. .36; lat. .22; alt. .08. (Carpenter.)

Shell small, white, rather short, with a thick but obscurely defined ray behind the anterior adductor scar. (Dall.)

TYPE locality, Puget Sound.

RANGE. Vancouver Island to Lower California.

Subgenus OUDARDIA Monterosato, 1884.

Tellina buttoni Dall, 1900.

Plate 44, figs. 7a, 7b.

Proc. U. S. N. M., **23**:324; pl. 4, figs. 12, 13 .

Shell elongated, subequilateral, compressed, polished, white, rounded before, slightly shorter and pointed behind, with a slight flexuosity; surface finely concentrically grooved, with wider interspaces, the sculpture stronger on the right valve and anteriorly; beaks low, inconspicuous; interior polished, white, with a well-marked thickened ray behind the

anterior adductor scar; pallial sinus reaching the ray, confluent below. Length, 16; height, 9; diameter, 3.5 mm. (Dall.)

TYPE in U. S. N. M., No. 42865a. Type locality, Guadaloupe Island, off Lower California.

RANGE. Lituya Bay, Alaska, to the Gulf of California.

Subgenus PERONIDIA Dall, 1900.

Tellina bodegensis Hinds, 1844.

Plate 44, fig. 5.

Voyage of Sulphur, Zool., **2**:67; pl. 21, fig. 2.

Shell of medium size, elongated, narrow-ovate, rather thick; umbones posterior to the center and pointing posteriorly; anterior portion of the shell evenly rounded, the dorsal and ventral lines being nearly parallel; posterior dorsal margin depressed back of umbo, running off quite obliquely to a line which truncates the posterior end near the base; basal posterior angle nearly a right angle; basal line nearly straight; a prominent bifid cardinal tooth on each valve; pallial sinus long and narrow; generally thickened anteriorly. (Hinds.)

Long. 48; alt. 25; diam. 12. umbo to anterior extremity 27; to posterior extremity 21 mm. (Arnold.)

TYPE locality, "Russian Bodegas."

RANGE. Queen Charlotte Islands, British Columbia, to the Gulf of California. In the Miocene in Oregon and at Walnut Creek, Contra Costa County, California; in the Pleistocene at San Pedro and San Diego.

Tellina santarosæ Dall, 1900.

Proc. U. S. N. M., **23**:321; pl. 3, fig. 6; pl. 4, figs. 1, 2.

Shell white, frequently with pale brownish concentric zonulation, and subtranslucent radial venulations; valves rather thin, compressed, hardly flexuous behind; beaks low, and nearly central; surface polished, concentrically evenly grooved with wider flat interspaces especially on the anterior half of disk; on the posterior fourth of the right valve the interspaces are narrower and elevated showing a tendency to become lamellose; if an imaginary line be drawn from the beak to the basal margin, in front of that line in the adult the concentric sculpture seems to fall suddenly, leaving an obscurely triangular area almost without sculpture; on the left valve the sculpture is not interrupted but appears feebler over the whole disk than in the right valve; hinge with the laterals obsolete, posterior radial callus not differentiated into a ray, pallial sinus low, short, mostly coalescent below. Length, 51.5; height, 24.5; diameter, 6 mm. (Dall.)

TYPE in U. S. N. M., No. 60212. Type locality, Santa Rosa Island, California.

RANGE. Santa Barbara Islands to San Diego, California.

Tellina lutea Gray, 1828.

Plate 1, fig. 9.

Index Test. Suppl.; pl. 1. *Conch. Iconica,* 17; sp. 97; pl. 19, figs. 97, a, b.

Shell ovate-subtrigonal, oblong, subequilateral, smooth, covered with a subolivaceous shining epidermis, rather pinkish orange within; posterior side slightly flexuous, obliquely angular, dorsal margin sloping, ligament long, large; anterior side with the dorsal margin sloped, ventral margin straight. (Conch. Iconica.)

TYPE in Museum Taylor. Type locality, Icy Cape.

RANGE. Arctic Ocean, Bering Sea, Aleutian Islands, and East Cook Inlet, Alaska.

Tellina lutea venulosa Schrenk, 1861.

Plate 1, fig. 11.

Bull. Imp. Akad. Sci. St. Petersburg, 4, p. 412. Reise in Amurl, pl. 22, figs. 2–5.

Shell elongate, subequilateral, covered with a thin shining brown epidermis. Color of the interior as in T. lutea, posterior side flexuous, obliquely angular. Ligament long, heavy, external. Shell differs from T. lutea, in being much narrower and more pointed at the posterior end.

TYPE in Acad. St. Petersburg. Type locality, Arctic Ocean.

RANGE. Shumagin Islands, Alaska, to Sakhalin, Japan.

Genus **METIS** H. & A. Adams, 1856.

Shell suborbicular, compressed, valves sillonated, posterior flexuosity submedian; no lateral teeth. (Tryon. S. S. Conch.)

TYPE. *Tellina meyeri* Dunker.

DISTRIBUTION. Pacific Coast.

RANGE IN TIME. Pleistocene, Pliocene, Miocene.

Metis alta Conrad, 1837.

Plate 57, fig. 3.

Jour. Acad. Nat. Sci. Phila, 7:258. *Thes. Conch., Tellina;* pl. 62, fig. 200.

Shell suboval, approaching to suborbicular, slightly ventricose, rather rough and unpolished with distinct prominent lines of growth; anterior extremity obtusely rounded; posterior side of the deeper valve biangulated; the opposite valve with an angular groove; margin broad, direct, slightly emarginate at the extremity, inferiorly; beaks central; color white tinged with yellow; cardinal plate broad; teeth long and prominent. Length, 1¾; height, 1½ inch. (Conrad.)

TYPE locality, Santa Barbara, California.

RANGE. Santa Barbara to San Diego, California. In the Miocene at Monterey; Pliocene at Santa Barbara, San Fernando and San Pedro; Pleistocene at San Pedro and San Diego, California.

Genus **MACOMA** Leach, 1819.

Shell oval, subrotund, convex; cardinal teeth narrow; no lateral teeth; pallial impression with a profound sinus. (Tryon. S. S. Conch.)

TYPE. *Macoma tenera* Leach (= *M. calcarea* Gmelin).

DISTRIBUTION. World-wide.

RANGE IN TIME. Tertiary.

Macoma middendorffii Dall, 1886.

Plate 53, fig. 1.

Proc. U. S. N. M., **7**:347 and **9**; pl. 4, fig. 11.

Shell triangular, solid, with broad hinge plate, and flattened left valve. Posterior side flexuous, with an obscure radiating angle; anterior side rather longer; right valve a little inflated and higher than the left. Length, 40; height, 45; diameter, 20. (Dall.)

TYPE in U. S. N. M. Type locality, Bering Sea.

RANGE. Bering Strait to Aleutian Islands and Chirikoff Island, Alaska.

Macoma incongrua Martens, 1865.

Plate 42, fig. 10.

Ann. Mag. Nat. Hist., **16**:430. *Conch. Iconica, Tellina;* pl. 27, fig. 146.

T. testa trigona rotundata, convexa, solidula, obsolete concentrica striata, opaca, albida, prope vertices subfasciate et facie interna media ochracea; antice rotundata, postice subrostrata, margine ventrali postice ascendenta; flexura distincta; ligamentum superficiale, dimidium marginis dorsalis postice, occupans; dens cardinalis valvæ sinistræ unicus crassiusculus, valvæ dextræ duo, posterior bifidus; margo cardinalis incrassatus; sinus palliaris magnus, per totam longitudinem cum linea palliari concretus, in valva sinistra musculum anticum attengens, in dextra ab eo sat remotus. Length, 33; alt. 27, crass, 15 mm. (Martens.)

Shell small, white, trigonal, convex, solid, concentrically and irregularly striated, with a very thin epidermis; posterior side subacuminate; angle obscure flexuous conspicuous, anterior side rounded and longer than the posterior. Cardinal teeth small, no lateral.

TYPE locality, Yokohama, Japan.

RANGE. Arctic Ocean to San Diego, California. Also Japan.

Macoma brota Dall, 1916.

Plate 9, fig. 2.

Proc. U. S. N. M., **52**:413. *Zool. Beechey's Voy., Moll.;* pl. 44, fig. 7.

Shell subovate, dull white, striated; posterior side strongly flexuous, with obscure radiating angle, postangular area convex, with dorsal margin

sloping, end subtruncated, sinuous; anterior side somewhat inflated, rather longer, dorsal margin, obliquely convex, umbones sloping backward, ligament partly imbedded, hinge margin with small central and no lateral teeth. (Conch. Iconica.)

This is *Tellina edentula* Broderip and Sowerby.

TYPE in U. S. N. M. Type locality, Bering Strait.

RANGE. Arctic Ocean, Bering Sea to Puget Sound.

Macoma brota lipara Dall, 1916.

Plate 42, fig. 6.

Proc. U. S. N. M., **52**:414.

Shell resembling *brota* but more rotund, less rostrate, with a wider and rounder anterior end, shorter and more rounded posterior end, and more polished surface. Length, 74; height, 57; diameter, 25. (Dall.)

TYPE in U. S. N. M. No. 223032. Type locality, same as the typical.

RANGE. South of Bering Strait to Puget Sound.

Macoma sitkana Dall, 1900.

Proc. U. S. N. M., **23**:323; pl. 4, figs. 6, 7.

Shell thin, calcareous, elongate, nearly equilateral, white, with a dull papyraceous, grayish-olive periostracum; surface marked only by lines of growth, which are stronger posteriorly; anterior end larger and pretty evenly rounded, posterior end attenuated, rather squarely truncate, flexuous, and moderately gaping; hinge delicate, normal; pallial sinus discrepant in the two valves, in the right valve shorter and higher and about half confluent below, in the left longer, nearly reaching the adductor scars and almost entirely confluent with the pallial line below. Length, 41; height, 26; diameter, 10 mm. (Dall.)

TYPE in U. S. N. M., No. 108656. Type locality, Sitka Harbor, Alaska.

RANGE. Kodiak Island to Lituga and Sitka, Alaska.

Macoma kelseyi Dall, 1900.

Trans. Wagner Inst., **3**:1052; pl. 9, fig. 7.

Shell large, solid, heavy, compressed, slightly flexed; beaks subcentral, prominent, pointed; anterior end evenly rounded into an arcuate base and dorsal margin; posterior end lanceolate, the dorsal margin nearly rectilinear; surface sculptured only by strong, rather irregular lines of growth; hinge plate short, broad, and strong; teeth normal, elongated, large; pallial sinus discrepant in the two valves; left valve with the upper part of the sinus sinuous, extending from the posterior to the anterior adductor, behind which is a thickened obscure ray; right valve with the sinus short, gibbous, the anterior end rounded, thence the line curves backward before coalescing with the pallial line below; in the left valve the sinus is coinci-

dent with the whole of the pallial line below. Length, 86; height, 56; diameter, 20 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Pleistocene of San Diego, California.

RANGE. Living in Puget Sound. In the Pleistocene at San Pedro and San Diego, California.

Macoma inquinata Deshayes, 1854.

Plate 45, figs. 2a, 2b, 3a, 3b.

Proc. Zool. Soc., p. 357. *Conch. Iconica, Tellina;* pl. 30, fig. 164.

Shell ovate, compressed, solid, pale fulvous, subequilateral, smooth or irregularly striated; posterior side somewhat wedge-shaped, subrostrated, dorsal margin depressed, sloping, end truncated, radiating angle obtuse, flexure not conspicuous; anterior side rather rounded, dorsal margin sloping, umbones acuminated, ligament large, prominent. (Conch. Iconica.)

TYPE in Museum Taylor. Type locality, Vancouver Island, British Columbia.

RANGE. Bering Sea to Monterey, California. Also Japan. In the Pleistocene at Monterey and San Diego, California; Pliocene at Twelve Mile House and San Fernando, California.

Macoma inquinata arnheimi Dall, 1916.

Plate 42, fig. 9.

Proc. U. S. N. M., 52:414.

Shell resembling the typical *inquinata* but shorter, and relatively more plump; the beaks 15 mm. behind the anterior end; the basal margin somewhat produced; the rostration shorter, less pronounced and less obliquely twisted. Length, 38; height, 30; diameter, 15 mm. (Dall.)

TYPE in U. S. N. M., No. 122537. Type locality, Kodiak Island, Alaska.

RANGE. Kodiak Island, Alaska, to San Francisco, California.

Macoma balthica Linnæus, 1758.

Plate 44, figs. 1, 2, 9.

Syst. Nat., ed. 10, p. 677. *Thes. Conch., Tellina;* pl. 50, fig. 121.

Shell rather round, thick, somewhat ventricose, pale rose or white, with a thin epidermis equivalve, dorsal margin arched, sloping, ventral margin slightly excavated near the umbones. Length, 27; height, 22; diameter 11 mm. (Conch. Iconica.)

TYPE locality, Baltic Sea.

RANGE. Point Barrow, Arctic Ocean, to San Diego, California. Also Japan. Circumboreal.

Macoma oneilli Dall, 1919.

Plate 40, fig. 7.

Sci. Res. Canadian Arctic Exp., **8**: pt. A, 20A; pl. 2, fig. 1.

Shell small, thin, oval, compressed, inequilateral, slightly inequivalve, the anterior part more than twice as long as the part behind the umbos; white, covered with a dehiscent yellowish olive periostracum; beaks hardly perceptible, ligament prominent, posterior end with an extremely narrow compressed dorsal margin corresponding to the fold of most species; anterior and posterior ends subequally rounded; dorsal and basal margins nearly equally arcuate; interior chalky white, the hinge with two small but well-marked teeth in each valve, the anterior left cardinal bifid; pallial sinus rounded behind, coalescent below, a little smaller in the right valve than in the other; muscular impressions subequal and of moderate size. Length of shell, 21; length in front of the vertical from the beaks, 15; height, 15; diameter, 6 mm. (Dall.)

TYPE in Ottawa, No. 4240. Type locality, Dolphin and Union Strait, Arctic.

RANGE. Known only from type locality.

Macoma moesta Deshayes, 1854.

Proc. Zool. Soc., p. 361. *Proc. U. S. N. M.*, **23**; pl. 4, fig. 8.

T. testa regulariter ovata, transversa, crassiuscula, tumidula, tenui, valde inæquilaterali, sub epidermide tenui, pallide viridi-flavicante alba, subcretaces, transversim obsolete striata, striis, latis, subplanis, irregularibus; latere antico longiore, obtuso, margine inferiore superioreque convexiusculis, parallelis; latere postico obtuso, paulo angustiore, flexura parum profunda; ligamento brevi, partim infosso; cardine angustissimo, bidentato, dentibus minimis, laterali antico nullo, postico obsoleto; sinu pallii brevi, late ovato. (Deshayes.)

Shell ovate, inflated, smooth, thin very inequilateral, equivalve, covered with a greenish epidermis; posterior side short, slightly angular, finely concentrically wrinkled at the angle, narrow behind the angle; dorsal margin sloped, and subtruncated; anterior side rather obliquely produced. Cardinal teeth small, lateral teeth none. (Conch. Iconica.)

TYPE in Museum Cuming. Type locality, Northern Ocean.

RANGE. Arctic Ocean, Bering Sea, Shumagin Islands. Also Atlantic.

Macoma calcarea Gmelin, 1792.

Plate 42, fig. 5.

Syst. Nat., **7**:3236. *Conch. Cab.*, ed. 1, **6**:140; pl. 13, fig. 136.

Shell ovate, white, smooth, covered with a thick epidermis; posterior side rather short, slightly compressed, scarcely radiately angular, with

inconspicuous flexure, dorsal margin straight, sloping, end subtruncated, ventral margin sloping upward; anterior side oblong, round, subinflated, with the upper edge convexly sloping, umbones small, sloping backward, ligament elongated, prominent, cardinal teeth small, no lateral teeth. (Conch. Iconica.)

TYPE in Museum Taylor. Type locality, Iceland or Greenland.

RANGE. Arctic Ocean to Monterey, California. Also Japan. Circumboreal. In the Pleistocene of Scandinavia, Scotland, Greenland, Siberia, and San Pedro, California; Pliocene at San Pedro, California.

Macoma nasuta Conrad, 1837.

Plate 45, figs. 1a, 1b, 1c, 1d.

Jour. Acad. Nat. Sci. Phila., 7:258. *Thes. Conch., Tellina;* pl. 64, fig. 224.

Shell ovate, compressed, smooth but not polished; anterior side dilated; posterior side cuneiform, extremity truncated, much above the line of the base; fold carinated on the superior valve; beaks central, slightly prominent; epidermis extremely thin and deciduous, finely wrinkled, brown; pallial impression of the left valve joining the anterior cicatrix at its lower posterior angle. Length, 1¾; height, 1⅓ inches. (Conrad.)

TYPE in Phila. Acad. Nat. Sci. Type locality, near San Diego, California.

RANGE. Kodiak Island and Cook Inlet, Alaska, to Scammons Lagoon, Lower California. In the Pleistocene at Santa Barbara, San Diego, San Pedro and Ventura; Pliocene at Eagle Prairie and Danget Creek in Humboldt County, Santa Rosa, San Fernando, and San Diego; Miocene at Sunol, Alameda County, and Foxen's, Santa Barbara County, California.

Macoma inflatula Dall, 1897.

Plate 13, fig. 15, and plate 1, figs. 2, 8.

Bull. Nat. Hist. Soc. Brit. Col., 2:11; pl. 1, figs. 19, 20.

Shell small, thin, inflated; full and rounded in front; shorter, compressed and pointed behind, the rostrum strongly bent to the right; surface smooth except for lines of growth, often polished cream color or whitish, sometimes pale brown with darker umbones, covered with a papery, dehiscent epidermis, which is either gray or greenish; ligament short; interior whitish, the pallial sinus reaching before the vertical of the beaks, rounded, subequal in the two valves; left with a strong slightly bifid anterior, and a simple smaller posterior cardinal tooth; right valve with two nearly equal grooved cardinals. Length, 24.5; height, 17.5; diameter, 8.5 mm. (Dall.)

TYPE in U. S. N. M. Type locality, Comox, Vancouver Island, British Columbia.

RANGE. Arctic Ocean to Ballenas Lagoon, Lower California.

Macoma leptonoidea Dall, 1895.

Nautilus, 9:33. *Proc. U. S. N. M.,* 23:308, 323; pl. 4, figs. 4, 9.

Shell very thin, short, high, polished, smooth or with fine silky concentric striulæ under a thin iridescent epidermis; hinge very feeble, teeth as in *M. limula;* pallial sinus irregular, reaching about two-thirds the whole length, backward from the front edge of the valves; outline of valves leptonoid, the anterior slope longer and more rounded, the posterior shorter and more direct but not rostrate, though there are two obscure ridges radiant backward from the beaks but not modifying the posterior margin; the shell is somewhat compressed but not flattened. Length, 13; height, 16; diameter, 6 mm. (Dall.)

TYPE in U. S. N. M., No. 125532. Type locality, Matagorda Bay, Texas.

RANGE. Santa Barbara Channel. Also Texas coast.

Macoma quadrana Dall, 1916.

Plate 3, fig. 6.

Proc. U. S. N. M., 52:414.

Shell small, white, polished, intermediate between *M. carlottensis* Whiteaves and *M. inflatula* Dall, but smaller than either; periostracum pale straw color, slightly iridescent, microscopically concentrically striated; anterior end larger, posterior end short, obliquely subtruncate, the rostrum slightly bent to the right; the right valve a little flatter than the left; two faint low riblets extending from the beaks to the posterior basal angle; hinge very weak, pallial sinus deep and high. Length, 19; height, 13.5; diameter, 7 mm. (Dall.)

TYPE in U. S. N. M., No. 225421. Type locality, Point Conception, Station 2892, in 284 fathoms.

RANGE. Boca de Quadra, Alaska, to Coronado Islands, Lower California.

Macoma carlottensis Whiteaves, 1880.

Rep. Progress Geol. Surv. Canada, 1879–80, p. 196 B, fig. 1.

Shell small, moderately inflated, thickness rather more than one-half the height, inequilateral; valves slightly flexed to the right posteriorly; test thin and fragile. Anterior side produced, evenly rounded at its extremity, and nearly twice as long as the posterior side; posterior side short, much narrower than the anterior, subcuneiform, sloping convexly and abruptly from above downward, and at last forming a subangular junction with the ventral margin below. Ventral margin gibbous in advance, ascending and much straiter behind. Beaks small, moderately prominent, incurved, and placed considerably behind the middle. Ligament short, external. Surface glossy, marked by very fine, close-set, concentric stria-

tions, and by a few, distant, lines of growth. Color of young shells translucent and often opalescent white or whitish. The lower portion of adult shells, when in good condition, is covered with a thin, pale ashen gray epidermis, and the shells themselves are often tinged with a pale grayish or brownish hue. Right valve with two minute, widely diverging, cardinal teeth; left valve with a single, very small, narrowly triangular tooth, which under the lens appears to be grooved down the middle; lateral teeth obsolete or nearly so. Pallial sinus profound, rounded at its extremity, and reaching beyond the center of the valve. Length of an adult, 6 lines; height of same, 4½ lines; thickness, 3 lines.

TYPE in Ottawa. Type locality, Virgo Sound, Queen Charlotte Islands, British Columbia.

RANGE. Arctic Ocean to Puget Sound.

Macoma liotricha Dall, 1897.

Plate 22, fig. 8.

Nat. Hist. Soc. Brit. Coll. Bull., **2**:12; pl. 1, fig. 21.

Shell large, thin, somewhat inflated, with a polished straw-yellow periostracum, and rather coarse concentric lines of growth; valves nearly equilateral, the ligament strong, external; base rounded evenly into the rounded anterior end, posterior end bluntly pointed with two faint radial plications hardly indenting the margin; valves gaping a little dorsally, in front of the beaks; left valve slightly smaller than the right, beaks small and low; internally chalky white, the pallial sinus deep, roughly triangular, slightly large in the left valve, cardinal teeth thin, feeble, often obsolete or eroded, two in each valve. Length, 45; height, 34; diameter, 16 mm. (Dall.)

TYPE in U. S. N. M. Type locality, British Columbia.

RANGE. Aleutian Islands and Shumagin Islands, Alaska, to British Columbia.

Macoma expansa Carpenter, 1865.

Suppl. Rep. Brit. Assoc., p. 369. *Proc. Acad. Nat. Sci. Phila.*, 1865, p. 56.

M. t. "M. *proximæ*" simili sed majore, multo tenuiore; antice minus, postice plus expansa, regulariter excurvata; t. jun. subdiaphana, subepidermidem tenuem, stramineam, subnacrea; t. adulta alba, nitida; dentibus cardinalibus ii. —i. minimis, haud bifidis; sinu palii valva altera per tres quadrantes; altera per quinque inter septem partes interstitii porrecto. Long. 1.55; lat. 1.13; alt. .5. (Carpenter.)

Scars like *lata* and *calcarea* in Mus. Cuming, but teeth not bifid, very thin, glossy. Scarcely differs from *lata Desh.* (Carpenter.)

TYPE locality, Puget Sound.

RANGE. Puget Sound to La Jolla, California.

Macoma yoldiformis Carpenter, 1864.

Plate 44, fig. 6.

Suppl. Rep. Brit. Assoc., p. 630. *Proc. Acad. Nat. Sci. Phila.*, 1865, p. 55.

M. t. parva, valde transversa, subplanata, yoldiformi; alba, tenua, subdiaphana, politissima; epidermide nitente, pallide straminea induta; lineis incrementi, postice conspicuis, exceptis, lævi; parum inæquilaterali, umbonibus postice inflectis; marginibus undique (regione ligamenti excepta) regulariter excurvatis; intus nympha ligamentali concava, subcelata; postice secta, dein parum alata; dentibus cardinalibus valva sinistrali ii., quorum unus bifidis; margine dorsali antico excurvato; sinu pallii obscure triangulato, paulo plus quam duas trientes interstitii inter cicatrices adductores minores porrecto. Long. .68; lat. .4; alt. .15. (Carpenter.)

Shell small, subelliptical, compressed, very thin and fragile; umbones slightly posterior to center; anterior end evenly rounded, longer than posterior side, which is very faintly folded, biangular and more cuneiform; surface smooth, except for very fine incremental lines; ligamental area scooped out about one-half length of posterior end; teeth very small. (Arnold.)

Type locality, Boreal, Pacific.

Range. Puget Sound to San Diego, California. In the Pleistocene at San Pedro, California.

Macoma truncaria Dall, 1916.

Proc. U. S. N. M., **52**:414.

Shell small, subquadrate, white, nearly equilateral, the posterior end slightly shorter, attenuated subtruncate; basal margin nearly straight, anterior end evenly rounded, beaks not prominent, dorsal slopes subequal, the posterior steepest; sculpture only of incremental lines irregularly prominent; hinge teeth feeble; interior chalky white, the pallial sinus reaching only to the vertical of the beak, rounded, free from the pallial line. Length, 15; height, 10; diameter, 4 mm. (Dall.)

Type in U. S. N. M. No. 210916. Type locality, Arctic coast between Cape Halkett and Gary River.

Range. Known only from the type locality.

Macoma alaskana Dall, 1900.

Plate 13, fig. 14.

Proc. U. S. N. M., **23**:323; pl. 3, fig. 5.

Shell small, very inequilateral, moderately inflated, white, with a polished pale-green periostracum; beaks low but acute, two-fifths of the whole length of the shell from the posterior end; anterior end produced, evenly rounded, posterior end descending rapidly to a rather blunt point;

surface sculptured only with faint incremental lines; hinge normal, strong for the size of the shell; pallial sinus discrepant, in the right valve small, gibbous, short, about two-thirds confluent below; in the left valve large, reaching nearly to the anterior adductor scar, and three-fourths confluent below. Length, 14; height, 9; diameter, 4 mm. (Dall.)

TYPE in U. S. N. M., No. 108652. Type locality, Lituya Bay, Alaska.

RANGE. Lituya Bay to Sitka, Alaska.

SECTION REXITHÆRUS Conrad, 1869.

Macoma indentata Carpenter, 1866.

Plate 44, fig. 4.

Suppl. Rept. Brit. Assoc., p. 639. *Proc. Cal. Acad. Nat. Sci.*, **3**:208.

M. t. "M. *sectæ*" simili; sed postice valde rostrata, sinu inter plicam et regionem ventralem valde expansam indentato. Long. 2.20; lat. 1.40; alt. 0.56. (Carpenter.)

Like *secta*, juv., but beaked, indented, and ventrally produced. (Carpenter.)

Shell of medium size, rather narrow, suboval, compressed, thin; umbones slightly posterior to center; anterior end long and evenly rounded; posterior dorsal line straight; ventral line near posterior end indented, the posterior extremity being much projected and sharply rounded; fold prominent; ligamental area short, scooped out. (Arnold.)

TYPE locality, San Pedro, California.

RANGE. Santa Barbara, California, to Lower California. In the Pleistocene at San Pedro and San Diego; Pliocene, El Toro Ranch, Monterey County, and Griswold's, San Benito County, California.

Macoma indentata tenuirostris Dall, 1900.

Proc. U. S. N. M., **23**:309.

Differs from the typical *indentata* in being more elongated, with a shorter and more pointed posterior end and deeper flexure. Long. 56; alt. 33; diameter, 16 mm. (Dall.)

TYPE in U. S. N. M. Type locality, San Pedro, California.

RANGE. Santa Barbara Islands to San Diego, California.

Macoma secta Conrad, 1837.

Plate 44, fig. 8.

Jour. Acad. Nat. Sci. Phila., **7**:257. *Thes. Conch., Tellina;* pl. 65, figs. 245, 248.

Shell triangular or subelliptical, equilateral, compressed, thin, smooth and polished, covered with a very thin shining yellowish epidermis; umbonal slope angulated; posterior extremity broadly and obliquely truncated; cartilage short, thick, inserted on an elongated oblique riblike callous; margin beneath the cartilage with an ovate gape, appearing as if

cut or broken, color white within and without. Length, 2; height, 1¼ inches. (Conrad.)

TYPE in Phila. Acad. Nat. Sci.? Type locality, San Diego, California.

RANGE. Vancouver Island to the Gulf of California. Also Japan. In the Pleistocene at Santa Barbara and San Diego and the Pliocene at Santa Barbara, California.

Family SEMELIDÆ.

Genus **Semele** Schumacher, 1817.

Shell rounded, subequilateral, beaks turned forward; posterior side slightly folded; hinge teeth 2.2, laterals elongated, distinct in the right valve; external ligament short, cartilage internal, long, oblique; pallial sinus deep, rounded. (Tryon. S. S. Conch.)

TYPE. *Tellina reticulata* Spengler.

DISTRIBUTION. West Indies, Brazil, India, China, Australia, Peru, west coast of United States.

RANGE IN TIME. Pleistocene, Eocene.

Semele decisa Conrad, 1837.

Jour. Acad. Nat. Sci. Phila., 7:239; pl. 19, fig. 2.

Shell suborbicular, thick, with ribs thick concentric rugosed, slightly prominent ribs; posterior side shorter than the anterior, direct, biangulated; fold distinct; beaks elevated; color yellowish with faint red rays, generally obsolete or wanting; within bright rose red fading into white in the center; lateral teeth distinct in each valve. Length, 5 inches. (Conrad.)

TYPE locality, San Diego, California.

RANGE. San Pedro to San Diego, California. In the Pleistocene at San Pedro and San Diego.

Semele striosa C. B. Adams, 1852.

Plate 9, fig. 3.

Panama Shells, p. 291.

Shell elliptical, slightly flexuous, inequilateral; with the posterior dorsal margin slightly excurved, with the anterior dorsal margin concave, otherwise with the margin well rounded; pale yellowish brown; with numerous fine raised concentric lines, and closely crowded radiating striæ, which are mostly microscopic; beaks small, approximate; umbones convex; corselet and lunule not well defined. Length, .78; height, .71; diameter, .33 of an inch. (C. B. Adams.)

TYPE in Amherst College Collection. Type locality, Panama.

RANGE. Catalina Island, California, to Panama.

Semele rupicola Dall, 1915.

Plate 11, figs. 9, 10.

Proc. Acad. Nat. Sci. Phila., p. 26.

Shell of medium size, thick, with numerous concentric growth lines, giving the exterior of the shell a rough appearance. Beaks slightly elevated. Interior stained a bright color around the edge. Pallial sinus deep. Length, 40 mm.

This is *Semele rupium* of California authors, following Carpenter; not Sowerby, 1832.

TYPE locality, Santa Cruz.

RANGE. Santa Cruz, California, to the Gulf of California.

Semele rubropicta Dall, 1871.

Plate 43, fig. 10.

Amer. Jour. Conch., 7:144; pl. 14, fig. 10.

Shell usually pure white, and brilliantly polished within, but occasionally with a faint yellowish or pinkish flush when very deeply colored externally. Inner margin, except on the hinge line, always pure white. Outside, covered with a thin yellowish green or olive epidermis usually wanting, color yellowish white, with rose-pink and pure white rays, color stronger on the lines of growth. Sculpture consisting of incised lines radiating from the umbones where they become obsolete; crossed by rounded, smooth, concentric ridges rather sharply defined by concentric grooves. These ridges are usually regular but sometimes bifurcating. In perfect specimens the radiating lines and grooves are so sharp that their intersections appear as if punctured. Ligament pit deep and excavated, cardinal and lateral teeth moderate. Anterior end much produced, rounded, margin rounded below, posterior end very short, almost truncated; shell rather inflated. Lunule deeply impressed, narrow, lanceolate, short. General form subquadrate. Umbones inconspicuous, usually tinged with yellow. Hinge line below the lunule with a purple spot. Interior marked with extremely faint radiating lines. Posterior portion of the inferior margin produced. Shell thick and solid. Length, 1.35; height, 1.55; diameter, .7 inches. (Dall.)

TYPE in U. S. N. M. Type locality, Beach at Soquel, Monterey Bay, California.

RANGE. Forrester Island, Alaska, to Tia Juana, Lower California.

Semele pacifica Dall, 1915.

Plate 3, fig. 5.

Acad. Nat. Sci. Phila., 1915, p. 27.

This is the shell usually referred to *S. cancellata* Sowerby, 1830 (*S. bellestriata* Conrad, 1837), but which differs from that Atlantic species in

its smaller lunule, shorter and weaker right lateral tooth, and sharper and more delicate concentric sculpture. It is a rare form and doubtless the two descended from the same Oligocene ancestors. (Dall.)

TYPE in U. S. N. M. No. 211729. Type locality not given.

RANGE. Catalina Island, California, to Acapulco, Mexico.

Semele incongrua Carpenter, 1863.

Plate 11, figs. 12, 13.

Suppl. Rep. Brit. Assoc., p. 640. *Proc. Cal. Acad. Sci.*, 3:208.

S. t. forma et indole S. *"pulchræ"* simili, sed sculptura diversa; transversa, tenuii, subplanata, umbonibus prominentibus; pallide carnea, radiis intensioribus ornata; tota superficie minute et creberrime raditim striulata; marginibus dorsalibus postico rectiore, antico parum incurvato; reliquis regulariter excurvatis, parte antica diagonaliter valde producta; v. sinistr. liris crebris subacutis concentricis, antice sæpe irregulariter interruptis, postice circiter quaternis solum conspicuis extantibus; v. dextr. liris paucioribus, acutis, antice vix interruptis, postice alternantibus, extantibus; intus; dent. card. parvis, fossa cartilaginali angusta elongata; dent. lat. v. dextra, elongatis, regione cardinali purpureo tinctis; cicatr. adduct. subrotundatis; sinus pallii maximo, ovali, ascendente, per quintas inter sex totius interstitii partes porrecto; colore secundum paginam externam tincta et radiata. Long., 0.58; lat., 0.40; alt., 0.16. (Carpenter.)

Like *S. pulchra*, with concentric sculpture differing in right and left valves, fine radiating striæ all over. (Carpenter.)

TYPE in California State Collection, No. 1061. Type locality, Santa Barbara, California.

RANGE. Monterey, California, to the Coronado Islands, Lower California.

Semele pulchra Sowerby, 1832.

Proc. Zool. Soc., 1832, p. 57. *Conch. Ill., Amphidesma;* fig. 2.

Amph. testa ovali, pallida, superficie concentrice striata; intus albida, purpureo-varia; latere postico breviore; margine antica inclinata, striis nonullis radiantibus, strias incrementi decussantibus. Long. $1\frac{3}{20}$; lat. $\frac{4}{10}$; alt., 1 poll. (Sowerby.)

Shell oval, pale, surface concentrically striated; whitish within, variegated with purple; posterior side shorter, anterior margin inclined, rayed with a few striæ crossing the striæ of growth. (Conch. Iconica.)

This species was described as *Amphidesma pulchrum.*

TYPE in Cuming Museum. Type locality, Bay of Caracas, S. America.

RANGE. Monterey, California, to Ecuador. In the Pleistocene at San Pedro and San Diego, California.

Semele flavescens Gould, 1851.

Boston Soc. Nat. Hist., 4:392.

Shell subrotund, nearly equilateral, moderately convex, anterior end broadly rounded; posterior dorsal margin straight and sloping, the end less broadly rounded; posterior umbonal slope with an indistinct ridge; beaks acute, not prominent, anterior dorsal area excavated; posterior dorsal edge long lanceolate, concave, bounded by a distinct angle; surface pale orange near the beaks, becoming dingy white at the older stages, and covered by a dirty greenish epidermis; marked by concentric lamellar striæ, crossed by fine radiating striæ, especially across the disk. Interior tinted melon yellow, spangled with shining dots; siphonal sinus spatulate, veined with numerous diverging striæ; ligament pit deep and long; anterior lateral teeth approximate to beaks. Longitudinal, vertical, and transverse diameters two and three, two and one-eighth and one and one-fourth inches. (Gould.)

Type in Boston Soc. Nat. Hist. Type locality, San Diego, California.

Range. San Pedro to San Diego, California.

Genus **CUMINGIA** Sowerby, 1833.

Shell transversely oval, equivalve, rounded in front, subrostrated and slightly gaping behind, small, thin, often irregular in form; hinge with a spoon-shaped cartilage pit, and a small anterior cardinal tooth in each valve; two elongate lateral teeth in the right valve, less developed in the left; beaks small; surface concentrically ridged; pallial sinus very wide. Living in sponges, sand, and in the fissures of rocks. (Tryon. S. S. Conch.)

Type. *Cumingia mutica* Sowerby.

Distribution. West Indies, India, Australia, West America.

Range in Time. Pleistocene.

Cumingia lamellosa Sowerby, 1833.

Proc. Zool. Soc., 1833, p. 34. *Conch. Iconica., Cumingia;* pl. 1, fig. 2.

Cum testa ovata, minutissime decussata, antice roundata, postice acuminatiuscula; latere postice breviusculo, margine dorsali declivi. Long. 1.2; lat. 0.5; alt. 0.58 poll. (Sowerby.)

Shell oblong, regularly concentrically laminated, laminæ narrow, standing out, distant; anterior side short, rounded; posterior side angular, acuminated, subrostrated; ventral margin contracted near the end; dorsal margin sloped. (Conch. Iconica.)

Type in British Museum. Type locality, Chile.

Range. Crescent City, California, to Payta, Peru, and Chile. In the Pleistocene at Santa Barbara, San Diego, and San Pedro, California.

Family DONACIDÆ.

Genus **DONAX** Linnæus, 1758.

Shell trigonal, wedge-like, closed; front produced, rounded; posterior side short, straight; margins usually crenulated; hinge teeth 2.2; laterals 1—1 in each valve; ligament external, prominent; pallial sinus deep, horizontal. (Tryon. S. S. Conch.)

TYPE. *Donax trunculus* Linnæus.

DISTRIBUTION. Norway, Baltic, Black Sea, all tropical seas.

RANGE IN TIME. Cretaceous, Pleistocene.

Donax californica Conrad, 1837.

Jour. Acad. Nat. Sci. Phila., 7:254; pl. 19, fig. 1.

Shell elongated, somewhat pointed at both extremities; disks with very minute radiating lines; color yellowish, obscurely rayed; a brown stripe on the anterior and posterior sub-margin; within white and purplish brown; margin beautifully crenulated. (Conrad.)

TYPE locality, near Santa Barbara, California.

RANGE. Santa Barbara, California, to Panama. In the Pleistocene at San Pedro, California.

Donax gouldii Dall, 1919.

Plate 49, figs. 8, 9.

Boston Jour. Nat. Hist., 6:394; pl. 15, fig. 9.

Shell solid, ovate-triangular, ventricose, the surface faintly radiate striate, more distinctly so posteriorly, and then as if varnished so as to obliterate the furrows; color bluish white, pale fawn color, or rayed with these colors, and most specimens have one or more bluish zones; anterior dorsal slope rectilinear and nearly at a right angle with the posterior, which is a little curved; posterior end heart-shaped, faintly biangular, the umbonal angle obtuse and rather ill-defined, but the radiating striæ going to the posterior basal angle more distinct than elsewhere; anterior end rather acutely rounded; a very slight constriction of the basal margin posteriorly gives the anterior portion a somewhat pouched appearance. Teeth of the hinge well developed. Interior white, inclined to yellow, with violet clouds, especially within the pallial impression; a marginal blotch along each dorsal edge seems to be pretty constant. Basal margin with very decided teeth about the middle, becoming gradually more delicate in each direction. Long. diam., $^9/_{10}$ of an inch; vertical diam., $^6/_{10}$ of an inch; transverse, $^4/_{10}$ of an inch. (Gould.)

This is Gould's *D. obesus*.

TYPE in Boston Soc. Nat. Hist. Type locality, San Diego, California.

RANGE. Santa Barbara, California, to Acapulco, Mexico.

Donax conradi Deshayes, 1854.

Proc. Zool. Soc. 1854, p. 351. *Conch. Iconica,* **8**; pl. 5, fig. 29.

D. testa elongato-transversa, subtrigona, solidula, compressa, inæquilaterali, radiatim tenue striata, grisea, fusco dilute picta, postice violascente, aliquantisper albo-grisea vel rufescente, striis impressis in medio simplibus, antice posticeque punctatis; umbonibus minimis, albis, violaceo breviter biradiatis; latere antico elongato, attenuato, cuneformi, superne recto, declivi, postico oblique truncato, obtuso, inferne subangulato, striis multo tenuioribus; lunula elongato-lanceolata, angusta, impressa, violacea, angulo marginata; valvis intus violaceis; cardine albo; sinu pallii elongato, horizontali, obtuso, marginibus parallelis; marginibus tenue crenulatis. (Deshayes.)

Shell elongately ovate, rather gibbous, compressed at the margin, smooth, radiately closely grooved, grooves linear, the posterior, intermediate ridges minutely serrated; whitish, ash-banded; umbos purple, white-tipped; lunule and posterior area ash-purple, anterior side elongately rounded, posterior rather concavely truncated. (Conch. Iconica.)

Type in Mus. Cuming. Type locality, Gulf of California.

Range. San Diego, California, Central America.

Family PSAMMOBIIDÆ.

Genus **PSAMMOBIA** Lamarck, 1818.

Shell elongated, more or less pointed behind; compressed; somewhat rudely, concentrically sculptured; the posterior dorsal area frequently sculptured diversely from the disk; pallial sinus elongated and for the most part coalescent below with the pallial line. Pal. San Pedro. (Arnold.)

Type. *Tellina ferroensis.* Chemnitz.

Distribution. Britain, India, New Zealand, Pacific west coast.

Range in time. Cretaceous to Pleistocene.

Subgenus Gobræus Leach, 1852.

Psammobia regularis Carpenter, 1864.

Ann. Mag. Nat. Hist. (3), **13**:312.

P. testa minore, regulariter ovali subæquilaterali; violacea, plus minusve radiata seu maculata; lævi, striolis incrementi ornata; epidermide tenui, flavido-olivacea induta, postice rugulosa; marginibus undique regulariter excurvatis; umbonibus vix projectis; ligamento conspicuo; intus dent. card. ii. —1., haud bifidis; cicatr. adduct. postica rotundata, antica ovali; sinu pallii elongato, haud incurvato, per duos trientes interstitii porrecto. Long., 1.05; lat., 0.05; alt., 0.26 poll. (Carpenter.)

Type in U. S. N. M. Type locality, Cape San Lucas, Lower California.

Range. San Diego, California, to Cape San Lucas, Lower California.

Psammobia californica Conrad, 1848.

Plate 43, fig. 5.

Publ. Puget Sound Biol. Sta., **4**:57.

Shell of medium size, elongated, nearly equilateral, beaks very minute, a little posterior to the middle, anterior end sub-truncate above and produced and rounded below; posterior end evenly rounded. Surface smooth except for lines of growth. Length, 75; height, 45; diameter, 27 mm. (Oldroyd.)

Conrad named and figured the species, but did not publish a description.

TYPE locality, California.

RANGE. Aleutian Islands to San Diego, California. Also Japan and Kamchatka.

Psammobia edentula Gabb, 1869.

Plate 57, fig. 1.

Pal. Cal., **2**:53; pl. 15, fig. 11.

Shell moderately large, thin, flattened, elongated sub-elliptical, nearly equilateral; beaks minute, a little posterior to the middle, projecting almost insensibly beyond the cardinal line; cardinal margin sloping slightly and perfectly straight toward the two ends; anterior end convexly and very obliquely sub-truncate above, produced and rounded below; posterior end broadly and regularly rounded, a little less prominent below than above the middle; basal margin nearly straight. Surface nearly smooth in the middle, marked by pretty distinct lines of growth toward the ends, especially above. Length on beak to base, 1.3 inch; width, 2.6 inch; beak to anterior end, 1.45 inch. (Gabb.)

TYPE locality, Pliocene of San Fernando, California.

RANGE. San Pedro, Catalina Island, and San Diego, California, living. In the Pleistocene at San Pedro, and the Pliocene at San Fernando, California.

Genus **SANGUINOLARIA** Lamarck, 1799.

Shell large, sub-circular, inequivalve, more or less twisted, the right valve slightly flatter; the posterior cardinal in the left valve obsolete; the pallial sinus narrow in front and somewhat detached from the pallial line. Pal. San Pedro. (Arnold.)

TYPE. *Solen sanguinolentus* Gmelin.

DISTRIBUTION. World-wide.

RANGE IN TIME. From the Eocene.

Sanguinolaria nuttallii Conrad, 1837.

Plate 55, figs. 1, 4.

Jour. Acad. Nat. Sci. Phila., **7**:230; pl. 17, fig. 6.

Shell sub-ovate, thin, much compressed; posterior margin obliquely truncate; extremity angular; basal margin regularly arcuate; beaks small,

distant from the anterior margin, slightly prominent, acute; ligament short, very prominent; nymphs very prominent; color whitish, with purple zones and rays; epidermis polished, corn-colored, with paler spots and rays; cardinal teeth prominent, slender, fragile. Length, 2½ inches. (Conrad.)

TYPE locality, near San Diego, California.

RANGE. San Pedro to San Diego, California. In the Pleistocene at San Pedro, California.

Genus **HETERODONAX** Mörch, 1853.

Shell rounded-triangular, smooth, rather solid; two lateral teeth in each valve. (Tryon. S. S. Conch.)

TYPE. *Tellina bimaculata* Linnæus, 1758.

DISTRIBUTION. Atlantic and Pacific oceans.

Heterodonax bimaculata Linnæus, 1758.

Syst. Nat. ed. 10, p. 677. *Conch. Iconica, Tellina;* pl. 18, fig. 94.

Shell sub-cuneiform, compressed, solid, above and within two-spotted with red or purple, variously colored with interrupted rays; posterior side short, rather square, widely truncated at the end, dorsal margin short, ligament conspicuous; anterior side sub-acuminated, dorsal margin sloping, hinge margin with posterior lateral teeth remote, no anterior lateral teeth. (Conch. Iconica.)

This was described as *Tellina bimaculata* Linnæus.

TYPE in Museum Sowerby. Type locality, West Indies.

RANGE. Monterey, California, to Panama. Also Atlantic.

Genus **TAGELUS** Gray, 1847.

Beaks median or sub-posterior; teeth two in each valve, simple, pedunculate; valves without constriction or clavicle, straight; pallial sinus deep, reaching to or beyond the beaks; posterior adductor scar rounded; pallial sinus with the ventral part partially coalescent with the pallial line. Pal. San Pedro. (Arnold.)

TYPE. *Solen gibbus* Spengler.

DISTRIBUTION. East and west coasts of North and South America, Senegal and Mediterranean.

RANGE IN TIME. From the Miocene.

Tagelus californianus Conrad, 1837.

Jour. Acad. Nat. Sci. Phila., 7:233; pl. 18, fig. 3..

Shell oblong-oval, rather thin, convex; extremities equally rounded; basal margin slightly contracted in the middle; beaks central; color white,

tinged with yellowish brown, and marked with direct brown lines in the middle of the valves; epidermis straw color, with radiating wrinkles on the posterior slope. Length, 3½ inches. (Conrad.)

TYPE in Phila. Acad. Sci.? Type locality, near Santa Barbara, California.

RANGE. Santa Barbara, California, to Panama. In the Pliocene at San Diego and the Pleistocene at Santa Barbara, San Pedro and San Diego, California.

Tagelus affinis C. B. Adams, 1852.

Panama Shells, p. 300.

Shell much elongated, compressed cylindric, well-rounded at both extremities; ventral edge straight or slightly arcuated; white beneath a deep yellowish-brown epidermis; with unequal striæ of growth; beaks not prominent, a little behind the middle of the shell; umbos compressed along the middle; ligament broad, with stout nymphal callosities; teeth small, one in the left, and two in the right valve. Length, 2.25; height, .08; diameter, 0.55 inches. (C. B. Adams.)

TYPE in Amherst College Collection. Type locality, Panama.

RANGE. Santa Barbara, California, to Panama.

Subgenus MESOPLEURA Conrad.

Tagelus subteres Conrad, 1837.

Jour. Acad. Nat. Sci. Phila., 7:233; pl. 17, fig. 10.

Shell linear-oval, inflated or sub-cylindrical, slightly arcuate; beaks central, very obtuse, extremities equally rounded; color pale purple, obscurely rayed; epidermis yellowish brown, finely wrinkled; teeth two in each valve. Length, 2¼ inches. (Conrad.)

TYPE in Phila. Acad. Nat. Sci.? Type locality, Santa Barbara, California.

RANGE. Santa Barbara, California, to Panama.

Family SOLENIDÆ.

Genus **SOLEN (L.)** Scopoli, 1777.

Shell very long, sub-cylindrical, straight, margins parallel, ends gaping; beaks terminal, or sub-central; hinge teeth, one in each valve; ligament long, external; anterior muscular impression elongated; posterior oblong; pallial line extending beyond the adductors; sinus short and square. (Tryon. S. S. Conch.)

TYPE. *Solen vagina* Linnæus.

DISTRIBUTION. World-wide, except Arctic seas.

RANGE IN TIME. Carboniferous to Pleistocene.

Solen sicarius Gould, 1850.

Plate 49, fig. 1, and plate 18, fig. 1.

Proc. Boston Soc. Nat. Hist., 3:214. *Rep. U. S. Expl. Exp., Moll.;* fig. 501.

Shell elongated, transversely oblong, sub-cylindrical or tubular, somewhat falcate; beaks terminal; anterior extremity truncate obliquely at an angle of about 30°, somewhat everted, the portion posterior to a line across from the beak to the base convex; posterior extremity rounded; dorsal edge rectilinear; ventral edge regularly arcuate, so that the posterior extremity becomes about two-thirds the height of the anterior; surface notably undulated by the stages of growth, parallel to the posterior end; the dorsal and ventral triangles not definitely marked, covered by a firm, glistening, horn-colored epidermis; valves very convex. Hinge with a single, erect, recurved, triangular tooth in each valve. Length, 3½ inches; height, 7/20 of an inch; diameter, 9/10 of an inch. (Gould.)

Type locality, Strait of Juan De Fuca, and territory of Oregon.

Range. Vancouver Island, British Columbia, to San Diego, California. In the Pleistocene at San Pedro; the Pliocene at Twelve Mile Creek, San Mateo County, and San Fernando; the Miocene at Walnut Creek, Contra Costa County, California.

Solen rosaceus Carpenter, 1864.

Plate 49, fig. 6.

Suppl. Rep. Brit. Assoc., p. 638. *Ann. Mag. Nat. Hist.* (3), 15:177.

S. testa S. sicario simili, sed minore; multo angustiore, elongata, recta, extus et intus rosacea; epidemide tenue valde nitente. Long., 27; lat., 5; alt., 32 poll. (Carpenter.)

Type in British Museum. Type locality, Santa Barbara, California.

Range. Santa Barbara, California, to the Gulf of California. In the Pleistocene at Santa Barbara, San Pedro and San Diego; the Pliocene at Santa Rosa, San Ramon, Kirker's Pass, Contra Costa County, San Fernando and San Diego Well; the Miocene at Tamales, Marin County, and Martinez, Contra Costa County, California.

Genus **ENSIS** Schumacher, 1817.

Shell elongated, transverse, gaping and rounded-truncate at its extremities, straight or somewhat curved; hinge composed of two teeth in one valve and three in the other; anterior muscular impression elongated, horizontal; pallial impression with a short, truncated sinus; siphons short, divided.

Type. *Solen magnus* Schumacher.

Distribution. United States, Europe, Patagonia, Philippines, Australia.

Ensis californicus Dall, 1899.

Proc. U. S. N. M., **22**:110.

Shell small, slender, arcuate, the sides nearly parallel, the valves being slightly attenuated toward the ends, beaks anterior, the anterior truncation bluntly rounded, the posterior similar; color white with livid pink streaks concentrically disposed; epidermis olivaceous brilliantly polished; hinge with small and very delicate cardinals (usually broken off), one in the right and two in the left valve, the dorsal ridge comparatively strong and elevated, shorter than the ligament. Length, 60 mm. (Dall.)

TYPE in U. S. N. M., No. 158891. Type locality, off the Island of San Pedro Martir, Gulf of California.

RANGE. Monterey, California, to the Gulf of California.

Genus **SILIQUA** Mergerle, 1811.

Shell smooth, oblong; epidermis polished; an umbonal rib extending across the interior of the valve; pallial sinus short.

TYPE. *Solen radiatus* Linnæus.

DISTRIBUTION. India, China, Okhotsk, Bering Sea, Sitka, Oregon, California, Newfoundland, Atlantic United States.

Siliqua lucida Conrad, 1837.

Plate 52, fig. 2.

Jour. Acad. Nat. Sci., **7**:231; pl. 17, fig. 8.

Shell oblong, oval, compressed, thin, fragile, translucent; posterior extremity nearly direct, truncated; color bluish, with purple concentric zones, and two oblique pale rays on the posterior side; interior rib nearly direct. (Conrad.)

This was described as *Solicurtis lucidus* by Conrad.

TYPE locality, near Santa Barbara, California.

RANGE. Monterey, California, to Todos Santos Bay, Lower California. In the Pleistocene at San Pedro and San Diego, California.

Siliqua media Gray, 1839.

Zool. Beechey's Voy., p. 153; pl. 44, fig. 2.

Shell rather compressed, oblong-elliptical, gaping at each end, covered with a thick, greenish, shining epidermis; fortified within by a strong rib under the umbo in each valve; anterior side short, semi-ovate; posterior side oblong, dorsal margin rather straight; terminal margin rather truncated, ventral margin convex, sloped upward at the end. (Conch. Iconica.)

TYPE in British Museum. Type locality, Bering Sea?

RANGE. Arctic Ocean and south to the Okhotsk Sea, Bering Sea, and Cook Inlet, Alaska.

Siliqua patula Dixon, 1788.

Plate 48, fig. 1, and plate 52, fig. 1.

Dixon's Voy., p. 355, fig. 2.

This is a thin, brittle shell, smooth within and without; one valve furnished with two front and two lateral teeth; the other has one front and one side tooth, which slip in between the others in the opposite valve: from the tooth, in each valve, proceeds a strong rib, which extends to above halfway across the shell, and gradually loses itself toward the edge, which is smooth and sharp. The colour of the outside is white, circularly, but faintly, zoned with violet, and is covered with a smooth yellowish-brown epidermis, which appears darkest where the zones are: the inside is white, slightly zoned and tinted with violet and pink. (Dixon.)

TYPE in Swainson Collection. Type locality, Cook's River, N. W. Coast of America.

RANGE. Okhotsk Sea to Sitka, Alaska.

Siliqua patula alta Broderip and Sowerby, 1829.

Plate 47, figs. 1, 2.

Zool. Jour., **4**:362.

Testa albido-carnea, subovata, alta, antice rotundata, postice, epidermide fusca, extra marginem extensa. Long., 4$^{2}/_{10}$; lat., $^{9}/_{10}$; alt., 2$^{2}/_{10}$. (Broderip and Sowerby.)

TYPE in British Museum? Type locality, Arctic Ocean.

RANGE. Bering Strait to Kodiak Island, Alaska.

Siliqua patula nuttallii Conrad, 1837.

Plate 18, figs. 2a, 2b.

Jour. Acad. Nat. Sci. Phila., **7**:232; pl. 17, fig. 9.

Shell oblong-oval, thin, fragile, compressed; posterior margin more obtusely rounded than the anterior; color white, obscurely rayed; epidermis horn-color, with paler spots; beaks purple; cardinal teeth two in the right valve, lamellar, remote; in the right valve four; ribs broad, oblique. Length, 4½ inches. (Conrad.)

TYPE locality, Point Adams in the estuary of the Columbia.

RANGE. Lituya Bay, Alaska, to Monterey, California.

Family MACTRIDÆ.

Genus **LABIOSA** (Schmidt) Moller, 1832.

Shell oblong, widely gaping and reflected posteriorly; posterior slope narrow, defined by a carina; lateral teeth distinct, the anterior one oblique,

near the cartilage pit; ligament sub-external, marginal, not separated from the cartilage. Equals *Anatina*.

TYPE. *Mactra anatina* Spengler, 1802.

DISTRIBUTION. A single species on each shore of America.

RANGE IN TIME. Pliocene.

Labiosa undulata Gould, 1851.

Plate 21, fig. 11.

Proc. Boston Nat. Sci., **4**:89; *Jour.*, **6**, pl. 15, fig. 7.

Shell milk-white, fragile, concentrically undulated, ovate, ventricose; beaks a little anterior, gaping widely behind; the undulations ending abruptly at a posterior, sub-marginal ridge; the undulated portion is also minutely corrugated, the wrinkles running from the beaks toward the margin; an impressed area in front of the beaks is also destitute of waves; anterior half broadly rounded and tumid; posterior half narrowed, compressed and acutely rounded, the superior margin being a rectilinear slope. Length, 2½ inches; height, 2; diameter, 1¼ inches. (Gould.)

Described as *Lutraria undulata* Gould.

TYPE locality, La Paz, Lower California.

RANGE. San Pedro, California, to Panama. In the Pleistocene at San Pedro and San Diego, California.

Genus **MACTRA** Linnæus, 1758.

Shell nearly equilateral; anterior hinge teeth Λ-shaped, with sometimes a small laminar tooth close to it; lateral tooth doubled in the right valve.

TYPE. *Mactra stultorum* Linnæus.

DISTRIBUTION. All seas, especially within the tropics.

RANGE IN TIME. From the Lias to the Pleistocene.

Subgenus MACTROTOMA Dall, 1894.

Mactra dolabriformis Conrad, 1867.

Amer. Jour. Conch., **3**:193. *Nautilus*, **7**; pl. 5, fig. 1.

Shell triangular, equilateral, slightly ventricose, anterior side somewhat produced, subcuneate, rounded at the end; ventral margin regularly rounded anteriorly and medially; umbonal slope with a slight carinated line, and a distinct fold anterior to it; post umbonal area with an angular groove; epidermis yellow-olive, much wrinkled on the carinated line and post-umbonal slope; posterior end obliquely truncated, sub-emarginate; pallial sinus extends not to the middle of the valve, but opposite the posterior end of the fossette. (Conrad.)

This was described as a *Spisula* by Conrad.

TYPE locality, Panama.

RANGE. Lobitas, California, to Panama.

Mactra californica Conrad, 1837.

Plate 20, figs. 4, 5, 6.

Jour. Acad. Nat. Sci. Phila. **7**:240; pl. 18, fig. 12.

Shell triangular, compressed, equilateral; posterior margin rectilinear, posterior side with a carinated, rectilinear, sub-marginal line, beaks prominent, sulcated; epidermis brown, with concentric wrinkles; teeth lamellar, large, very prominent. (Conrad.)

TYPE locality, Santa Barbara, California.

RANGE. Neah Bay, Washington, to San Diego, California.

Mactra nasuta, Gould, 1851.

Proc. Boston Soc. Nat. Hist., **4**:88.

T. solida, transversa, ovato-cuneata, albida; epidermide stramineo postice incrassato et fuscato induta; vertice fere mediano, acuto; latere antico angutato, compresso, sub-adscendente; latere postice dilatato, truncato, hiate; area dosali postica lanceolata, excavata; intus polita, candida; fovea ligamentali perobliqua; dente V-formi tenui, elongato; dentibus lateralibus crassis. Long., 3¼; lat., 1; alt., 2¼ poll. The analogue of *M. brasiliana,* distinguished by the posterior portion of the beaks, and the more attenuated form of the anterior half caused by the concave outline of the dorsal margin. The parts composing the hinge are more oblique. (Gould.)

TYPE locality, Mazatlan, Mexico.

RANGE. San Diego, California, to Mazatlan, Mexico, and West Colombia.

Genus **SPISULA** Gray, 1838.

Shell small, subequilateral, trigonal, with a thin epidermis, adjacent beaks, and concentrically grooved dorsal areas; pallial sinus small, rounded; gape obsolete; valves convex; ligament sigittate, set in a callous area close to the dorsal margin and not set off from the chondrophore by any shelly ridge; dental armature normal, strong, not concentrated; the opposed surfaces of the laterals transversely grooved; left cardinal small, prominent, with a small posterior accessory lamella, the posterior ends of both projecting over the chondrophore; right cardinal with the arms coalescent above, the anterior arm close to the dorsal shell-margin; hinge plate thick and flattish; exterior smooth or concentrically striated; the dorsal areas ill-defined. (Dall.)

TYPE. *Mactra solida* (L.) Gray, 1847.
DISTRIBUTION. All seas, especially within the tropics.

Subgenus HEMIMACTRA Swainson, 1840.

SECTION MACTROMERIS Conrad, 1868.

Spisula alaskana Dall, 1894.

Plate 15, fig. 12.

Publ. Puget Sound Biol. Station, **4**:59, pl. 4, fig. 4.

Shell large, thick, somewhat compressed; the anterior side a little shorter, and the hinge margin is slightly concave, posterior slope convex and broader, the extremity slightly gaping. Base curved with the posterior end a little broader, beaks somewhat elevated, and behind them is an elevated line extending to the lower angle. Sculpture consists of irregular growth lines coarser toward the posterior end. Epidermis is coarse and wrinkled; the surface of the shell has a rugged appearance from the coarse growth lines, and rendered more rugged by the folds of the thick epidermis. Interior bluish-white. Hinge supports, strong and smoothly rounded, V-shaped tooth strong, with the anterior side in right valve more elevated than the posterior; lateral teeth short and slender. Muscular impressions large and pallial sinus deep and wide. Length, 135; height, 90; diameter, 50 mm. (Oldroyd.)

TYPE in U. S. N. M. Type locality, Alaska?

RANGE. Arctic Ocean at Cape Lisburne, south to Bering Sea and the Aleutians and eastward to Puget Sound. Also North Japan, the Kurile Islands, and Okhotsk Sea.

Spisula voyi Gabb, 1869.

Plate 23, figs. 1, 2.

Pal. Calif., **2**: 24; pl. 5, fig. 41.

Shell broad, inequilateral; beaks in advance of the middle; cardinal margin nearly straight and sloping; anterior end very much produced, rounded and narrow; posterior end obliquely truncated; base broadly and regularly rounded. Surface marked by numerous irregular and rather strong lines of growth. (Gabb.)

This was described by Gabb as *Callista voyi.*

TYPE in University of California collection. Type locality, Miocene or Pliocene, near Humboldt Bay, California.

RANGE. Puget Sound and north. Fossil in the Miocene and Pliocene of California.

Spisula hemphilli Dall, 1894.

Plate 46 and plate 50.

Nautilus, 7:137; pl. 5, fig. 2.

Shell large, thin, inflated, sub-equilateral, creamy white with a yellow, thin epidermis, which over the body of the shell in young shells is beautifully, evenly, concentrically striated and on the posterior dorsal area is irregularly wrinkled, with an elevated raphe of epidermis at the margin of the area; beaks rather prominent, the anterior end of the valves longer than the posterior; posterior dorsal slope excavated; lunule obscure, escutcheon marked by prominent, elevated, radial lines of epidermis; the dorsal margin pouting in front of the ligament, the posterior slope convex, the posterior flexure faint, but marked by a recession of the ventral border of the valves, which gape but very little and not at all in front; anterior end rounded, but smaller than the posterior; ventral border arcuate; hinge and pallial sinus much as in the last species, except that the sinus is somewhat smaller and less depressed. Length, 120; height, 93; diameter, 50 mm. (Dall.)

TYPE in U. S. N. M. Type locality, San Diego, California.

RANGE. San Pedro to San Diego, California. In the Pleistocene at San Pedro, California.

Spisula catilliformis Conrad, 1867.

Plate 24.

Amer. Jour. Conch., 3:193. *Nautilus,* 7; pl. 5, fig. 3.

Shell large, thin, whitish or straw color, irregularly, concentrically striated, with a gray, wrinkled epidermis, inflated short-oval sub-equilateral valves and closely adjacent inconspicuous beaks; anterior end of shell evenly rounded in front, a little shorter than the posterior end; lunule narrow, impressed, escutcheon narrow, longer, rather obscure; posterior end of valves rounded, slightly compressed and with a narrow gape when closed; hinge resembling that of *M. polynuma* Stimpson, but more concentrated, cartilage pit large, rather produced; posterior muscular impression larger, pallial sinus rather large, rounded in front. There is a faint posterior flexure of the valves and a feeble marked area above it, on which the epidermis is more conspicuous. (Conrad.)

TYPE locality, Panama.

RANGE. Neah Bay, Washington, to San Diego, California. In the Pleistocene at Ventura, San Pedro and San Diego; and the Pliocene at San Diego, California.

Spisula falcata Gould, 1850.

Plate 20, figs. 1, 2, 3.

Proc. Boston Soc. Nat. Hist., 3:216. *Rep. U. S. Expl. Exp., Moll.*, p. 393; figs. 506, a–b.

Shell large, solid, transversely ovate-triangular, sub-falcate, inequilateral, hinder end shorter, moderately gaping, white, covered with a thick, shining, dusky, straw-colored epidermis; surface delicately marked by incremental lines, with obscure, distant, radiating ridges; beaks acute, nearly touching, post-median, rather compressed; anterior end narrower than posterior, triangular, somewhat ascendant, extremity rather acute; posterior end broadly rounded, truncate at tip, in young specimens more triangular; basal edge regularly arcuate; anterior dorsal edge rectilinear, presenting a plane lanceolate space in front of the beaks; posterior dorsal edge rounded, with a coarse, loose, dusky epidermis. Valves slightly convex; within milk-white; siphonal sinus reaching as far as the beak. Cardinal areas large; ligamentary pit large, oblique, shallow; sides of V-tooth very unequal, strong; lateral teeth thin, elevated, anterior one of left valve bilobate. Length, 3¾; height, 2½; diameter, 1⅛ inches. (Gould.)

Type locality, Puget Sound, Washington.

Range. Puget Sound to Cortez Bank and Coronados Islands, Lower California. In the Pleistocene at San Pedro and San Diego; the Pliocene, at Eagle Prairie, Humboldt County, and Kirker's Pass, Contra Costa County; the Miocene, at Martinez, Contra Costa County, Half Moon Bay, San Mateo County, Sunol, Alameda County, Siebeck's, Santa Clara County, Griswold's, San Benito County, Foxen's, Santa Barbara County, San Diego and Los Angeles, California.

Subgenus Symmorphomactra Dall, 1894.

Spisula planulata Conrad, 1837.

Jour. Acad. Nat. Sci. Phila., 7:240.

Shell triangular, much compressed, sub-equilateral; the posterior side rather shorter than the anterior; anterior side sub-cuneiform; posterior side with an obscure sub-marginal line, extremity rounded; beaks elevated; epidermis smooth, shining. Length, 1¾ inch. (Conrad.)

Type locality, near Santa Barbara, California.

Range. Monterey, California, to Cape San Lucas, Lower California.

Genus **SCHIZOTHÆRUS** Conrad, 1853.

Very closely allied to *Tresus,* with a deep channel on either side of the cardinal tooth. The terminations of the siphons are protected by two solid valves.

TYPE. *Lutraria nuttallii* Conrad, 1837.

DISTRIBUTION. West coast of North America.

Schizothærus nuttallii Conrad, 1837.

Plate 31, figs. 1a, 1b.

Jour. Acad. Nat. Sci. Phila., **7**:235; pl. 18, fig. 1. U. S. Fish Comm. Bull., **3**, No. 23:354, fig. 1.

Shell elliptical, slightly gibbous from beak to base; posterior side produced; ligament margin slightly declining; rectilinear, extremity obliquely sub-truncated, umbo prominent; colour white; epidermis very thin, brown, wrinkled on the margin. Length, 6 inches. (Conrad.)

TYPE locality near Santa Barbara, California.

RANGE. Wrangell, Alaska, to San Diego, California. In the Pleistocene at Santa Barbara and San Diego, and the Pliocene at Santa Barbara, California.

Schizothærus nuttallii capax, Gould, 1850.

Proc. Boston Soc. Nat. Hist., **3**:217. *Conch. Iconica, Mactra;* pl. 1, fig. 4.

Testa magnifica, ventricosa, ovato-rotundata, antice rotundata, postice subtriangularis, truncata, valde hians, concentrice undulato-striata, epidermide luteo-viridi (post costam medianum radiatim corrugato) induta; umbonibus tumidis, incubentibus, attigentibus: cardo validus; fovea lata, obliqua triangulari; dente cardinali crasso, erecto, plicato, basi appendiculato; dentibus lateralibus compressis, conspicuis. Interior calcarea; sinu siphonali linguiformi, dimidam longitudinis testæ attigente. Long., 5¾; alt., 4; lat., 3 poll. (Gould.)

No other species approaches this in size and capacity. (Gould.)

Shell very largely inflated, ovately sub-rhomboidal, inequilateral, transversely striated and rough, whitish, covered toward the margin with a black-brown epidermis, anterior narrowly gaping, posteriorly very broadly gaping; umbos large, obtuse, approximated; siphons of the mantle broad, deep, horizontal. (Conch. Iconica.) This is the description given by Middendorff, but he called it *Lutraria maxima,* and gives the habitat as California.

TYPE locality, Puget Sound.

RANGE. Kodiak Island, Alaska, to San Pedro, California.

FAMILY MESODESMATIDÆ.

Genus ERVILIA Turton, 1822.

Shell minute, oval, close; cartilage in a central pit; right valve with a single prominent tooth in front and obscure tooth behind; left valve with

two obscure teeth; no lateral teeth; pallial sinus deep. (Tryon. S. S. Conch.)

TYPE. *Mya nitens* Montagu, 1808.

DISTRIBUTION. West Indies, Britain, Canaries, Mediterranean, Red Sea, West Coast of America.

Ervilia californica Dall, 1916.

Proc. U. S. N. M., **52**:414.

Shell small, ovate, white with a rosy flush, inequilateral, the posterior end shorter; the beaks inconspicuous, the ends rounded, the basal margin arcuate; sculpture of fine close-set, regular, uniform concentric threads over the whole surface; hinge strong, pallial sinus small. Length, 7; height, 4.5; diameter, 2 mm. (Dall.)

TYPE in U. S. N. M., No. 151419. Type locality, San Pedro, California.

RANGE. San Pedro to San Diego, California.

Family MYACIDÆ.

Genus **MYA** (L.) Lamarck, 1799.

Shell oblong, inequivalve, gaping at the ends; left valve smallest, with a large flattened cartilage-process; pallial sinus large. (Tryon. S. S. Conch.)

TYPE. *Mya truncata* Linnæus, 1758.

DISTRIBUTION. Northern seas, West Africa, Philippines, Australia, California.

Mya truncata Linnæus, 1758.

Plate 10, fig. 4.

Syst. Nat. ed. 10, p. 670. Binney and Gould's *Invert. Mass.*, p. 59, fig. 376.

M. testa ovata postice truncata, cardinis dente antrorsum porrecto obtusissimo. (Linnæus.)

Shell oblong, inequipartite, longest and rounded before, narrower and abruptly cut off, generally obliquely, behind; valves are strong, deeply concave and often unequal, but sometimes the right valve, and sometimes the left, is most prolonged; surface irregularly ridged along the lines of growth; color dingy white, covered with a thick, tough, yellowish, wrinkled epidermis, which folds over the edges of the shell, and is greatly prolonged posteriorly, forming a tube six or eight inches long, supplying in some measure the apparent loss of protection to the animal by the truncation of the shell; the truncated edges are a little flaring, and the shell is left wide open behind; beaks moderately prominent, turning slightly forward; teeth broader than long, projecting a little inward; inner face smooth, and nearly flat; outer face similar to that of *M. arenaria*, but the

oblique rib merely forms a thickened lobe at the edge, and does project into a tooth-like process; on the opposite valve is an excavation in the beak for the reception of the tooth and the insertion of the ligament. Length, 2¾ inches; height, 1$^{7}/_{10}$ inches; breadth, 1⅕ inches. (Binney and Gould's *Invert. Mass.*)

TYPE locality, Europe.

RANGE. Arctic Ocean and from Bering Island to Puget Sound.

Mya arenaria Linnæus, 1758.

Plate 32, figs. 1a, 1b.

Syst. Nat. ed. 10, p. 670. Binney and Gould's *Invert. Mass.,* p. 55, fig. 375.

M. testa ovata postice rotundata, dente antrorsum porrecto rotundato denticuloque laterali. Habitat in O. Europæ. Septentrionalis sub arena, foraminibus duobus detegenda. Cardinis dens in altera tantum teste prominens cum denticulo parallelo versus sulvam. (Linnæus.)

Shell ovate, equivalve, nearly equipartite, moderately thick, gaping at both ends, especially at the posterior, which cannot be closed on account of an outward curvature of the valves; anteriorly shortest and regularly rounded; posteriorly narrowed and rounded; surface wrinkled, and in some parts raised into ridges at the lines of growth; faint, radiating lines and colors depart from the beaks; color dingy white, covered with a very thin, dirty-brown epidermis, irregularly wrinkled; beaks small, pointed, slightly curved forward, directly under which, in the left valve, rises an erect tooth, rounded at its summit, of about equal breadth and height; its inner face is smooth and rounded; its outer face is divided into two portions, the largest of which is spoon-shaped, the other flat and traversed across the middle by a grooved ridge which projects beyond the margin of the tooth like a smaller tooth; on the right valve we have a deep excavation imbedded in the cavity of the beak; in this and in the concave portion of the tooth is fixed the very strong cartilage; anterior muscular impression narrow and long, club-shaped; posterior one semi-oval; pallial impression scalloped along the base, and very deeply notched behind. Common length, 3½ inches; height, 2 inches; breadth, 1 inch. (Binney and Gould's *Invert. Mass.*)

TYPE in British Museum. Type locality, Northeastern Europe.

RANGE. Victoria, British Columbia, to Puget Sound and south to Monterey; found in old Indian mounds on Vancouver Island—an indication that the species is native. On the Atlantic it is found far up the St. Lawrence River, where it grows smaller and smaller, the whole coast of Nova Scotia, and Laborador, Cape Hope, James Bay, Greenland, and in England, where it is the most common shell. Abundant as a Pleistocene fossil throughout the north.

Mya intermedia Dall, 1898.

Plate 15, fig. 5.

Trans. Wagner Inst. Sci., **3**; pt. **4**:875.

This species is intermediate in character between *M. arenaria* and *M. truncata*, there are constant though not conspicuous differences in the hinge. This species grows to a very large size on the Alaskan Peninsula and is very puzzling. Length about 6 inches. (Dall.)

TYPE in U. S. N. M. Type locality, Alaska.

RANGE. From Point Barrow in the Arctic Ocean to Monterey, California.

Genus **Cryptomya** Conrad, 1837.

Shell inequilateral, transverse, oblong, gaping behind; valves with radiating (sometimes crossed by concentric) striæ; right valve with a lamellar tooth, left valve with a broad fossette; ligament internal; pallial impression with a small sinus. (Tryon. S. S. Conch.)

TYPE. *Sphœnia californica* Conrad.

DISTRIBUTION. California, Australia, Philippines.

RANGE IN TIME. Miocene to Pleistocene.

Cryptomya californica Conrad, 1837.

Jour. Acad. Nat. Sci. Phila., **7**:234; pl. 19, fig. 11.

Shell triangular, convex, thick, with numerous, irregular, lamellar, concentric striæ; posterior side compressed, cuneiform; beaks central, rather prominent; lateral teeth prominent. Length, 1¼ inch. (Conrad.)

TYPE locality, near Santa Barbara, California.

RANGE. Chichagof Island, Alaska, to Topolobampo, Mexico.

Genus **SPHENIA** Turton, 1822.

Shell oblong, inequivalve, inequilateral, more or less gaping anteriorly. Surface of the valve smooth or rugose, covered with an epidermis. Beaks incurved. Hinge composed of an erect, dilated laminar tooth in one valve, with a corresponding pit in the other. Ligament internal. Pallial impression with a slight sinuation. This rare and curious genus is as yet but very imperfectly known. The shell has evidently, at a glance, a striking resemblance to *Saxicava*. (British Mollusca). Forbes and Hanley.

TYPE. *Sphenia binghami* Turton.

DISTRIBUTION. Britain, West Coast of North America, Red Sea. Burrowing in limestone, oyster-shells and in roots of kelp, from deep water.

RANGE IN TIME. Tertiary.

Sphenia fragilis Carpenter, 1857.

Mazatlan Catalogue, p. 24, No. 30.

S. animali in cryptis latibulante, ergo varie distorto; testa parva, tenui, subnacrea, vix rugose striata; epidermide fusco-virente copiose induta, rugarum increscentium concentricarum plena, postice in siphone longa porrecta; parte postica plus minusve subcarinata; valva sinistra dente ligamentum ferente, plus minusve seu prolongata seu extante; dextra alveo conveniente, nonnumquam denticulo subticulo subextante; impressionibus muscularibus subrotundatis, sinu pallii lato, rotundato, haud alto. (Carpenter.)

Shell somewhat elongate, inequilateral, opaque, but not solid, inequivalve; the left valve being smaller and somewhat flatter; the epidermis is of a dull yellow, closely attached, beneath which the surface is almost smooth, or may be wrinkled with concentric and rather distant wrinkles of growth. The ventral margin more or less straight, and usually ascends a little behind. The right umbo projects somewhat above the dorsal line; beaks acute, and incurved. There is an umbonal ridge in each valve. Interior white. Hinge with an erect tooth in left valve and a corresponding tooth-receptacle in the right valve. This is a nestler and is irregular in form. Many species might be made out of the extreme forms. Some shapes are very short, inflated and gibbous, resembling *Corbula,* or sometimes *Neæra.* The ligamental plate becomes narrow, projecting and sinuated, more like the tooth of *Mya.* These varieties are seen in the young as much as in the adult shells. It is found living in the burrows of worms and mollusks, and in the kelp roots. Length, 11; height, 9 mm.

Type in British Museum. Type locality, Mazatlan, Mexico.

Range. Vancouver Island, British Columbia, to Mazatlan, Mexico.

Sphenia ovoidea Carpenter, 1865.

Suppl. Rep. Brit. Assoc., p. 637. *Proc. Acad. Nat. Sci. Phila.,* p. 54, 1865.

S. t. parva, albida, ovoidea; epidermide cinerea, parum rugosa, induta; marginibus, antico et ventrali regulariter excurvatis; dorsalibus rectis ad angulum circiter 150°; parte postica augustiore, obtuse angulata, parum truncata; umbonibus prominentibus, circiter ad duas inter quinque partes totius longitudinis sitis; intus, lamina cartilaginea lata, parum extante; sinu pallii ovali, usque ad medium interstitii porrecto. Long., .3; lat., .16; alt., .09, poll. (Carpenter.)

Siphonal area small; front excurved; mantle bend large. (Carpenter.)

Type locality, Puget Sound.

Range. Aleutian Islands to Puget Sound.

Sphenia truncula Dall, 1916.

Proc. U. S. N. M., **52**:415.

Shell short, whitish with a dirty ash-colored periostracum, rude and more or less distorted, abruptly truncate, almost equilateral, the anterior portion swollen, the posterior part attenuated. Length, 7; height, 4.3; diameter, 4 mm. (Dall.)

TYPE in U. S. N. M., No. 160116. Type locality, San Diego, California.

RANGE. San Diego, California, to Panama.

Sphenia pholadidea Dall, 1916.

Proc. U. S. N. M., **52**:415.

Shell small, thin, white, with a blackish periostracum, which is conspicuously laminate on the posterior dorsal area; very inequilateral, the anterior side shorter, the beaks inconspicuous, 4 mm. behind the anterior end; sculpture of rude incremental lines, posterior end abruptly truncate, hardly attenuated; pallial sinus rounded, not reaching the vertical of the beaks; hinge with a prominent tooth-like projection in the right valve behind the resilifer. Length, 12; height, 5.3; diameter, 4 mm. (Dall.)

TYPE in U. S. N. M., No. 2581. Type locality, Santa Barbara, California.

RANGE. Known only from the type locality.

Sphenia globula Dall, 1919.

Proc. U. S. N. M., **56**:370.

Shell small, white, with a dehiscent, brownish, papery periostracum which extends beyond the shell at the siphonal end; almost spherically inflated, short, truncate behind; beaks inconspicuous, situated about the middle of the valves; anteriorly the valves are rounded; behind they are compressed into a short rostrum about one-fourth the whole length; sculpture of rather rude lines of growth, the external layer obscurely granulose, especially in front; interior of the valves chalky white, the muscular impressions distinct, the pallial sinus rounded, slightly less than half the length of the valve, its impression formed by two almost separate, rather broad, patches; hinge as usual in the genus. Length, 12; height, 9; diameter, 9 mm. (Dall.)

TYPE in the Oldroyd Coll., Stanford University, No. 312. Type locality, Monterey, California.

RANGE. Known only from the type locality.

Genus **PLATYODON** Conrad, 1837.

Shell resembling the type *Myæ,* but with a less prominent and more dilated tooth; pallial impression slightly sinuous anteriorly; posterior sinus profound.

TYPE. *Platyodon cancellatus* Conrad.

DISTRIBUTION. California.

Platyodon cancellatus Conrad, 1837.

Plate 32, figs. 2a, 2b.

Jour. Acad. Nat. Sci. Phila., 7:236; pl. 18, fig. 2.

Shell sub-elliptical, ventricose, with numerous prominent, slightly undulated, concentric striæ; a slight furrow extends from beak to base; posterior side with radiating striæ; obsolete or wanting on the posterior slope; umbo prominent; posterior side short; cardinal tooth very erect, dilated, bi-marginate. Length, 3 inches. (Conrad.)

TYPE locality, near Santa Barbara, California.

RANGE. Bolinas Bay to San Diego, California. In the Pleistocene at San Pedro, California.

Family **CORBULIDÆ.**

Genus **CORBULA** Brugière, 1792.

Shell thick, inequivalve, gibbous, closed, produced posteriorly; right valve with a prominent tooth in front of the cartilage pit; left valve smaller, with a projecting cartilage process; pallial sinus slight; pedal scars distinct from the adductor impression. (Tryon. S. S. Conch.)

TYPE. *Corbula sulcata* Brugière.

DISTRIBUTION. United States, Norway, Britain, Mediterranean, West Africa, China. Inhabits sandy bottoms.

RANGE IN TIME. Inferior Oölite. United States, Europe, India.

Corbula obesa Hinds, 1843.

Proc. Zool. Soc., 1843, p. 57. *Zool. Sulphur Voy., Moll.,* pl. 20, fig. 12.

Shell ovate, thin, ventricose, pale, striated, posteriorly rounded, anteriorly truncated at the end, sharply angulated from the umbos; ventral margins of the valves closed in, gibbous; umbos smooth, straight. (Hinds.)

TYPE in Museum Belcher. Type locality, West Coast of America.

RANGE. Catalina Island, California, to Panama.

Corbula fragilis Hinds, 1843.

Proc. Zool. Soc., p. 56. *Zool. Sulphur Voy., Moll.*, p. 68; pl. 20, fig. 11.

Shell ovately diamond-shaped, thin, semi-transparent, white, longitudinally striated, striæ raised, numerous, close-set, crossed with exceeding fine lines radiating from the umbos; anterior side angularly produced; umbos rather depressed, straightly incurved. (Conch. Iconica.)

TYPE in Museum Belcher. Type locality, Veragua, Mexico.

RANGE. Monterey, California, to Magdalena Bay, Lower California.

Corbula luteola Carpenter, 1865.

Suppl. Brit. Assoc. Rep., p. 673. Arnold, *Pal. San Pedro*, pl. 17, fig. 11.

C. t. "C. biradiata," forma simulante, sed multo minore; haud obesa, transversa, luteo-cinera, dorsum versum interdum obscure biradiata; angulo plus minusve carinato, postice definato; antice rotundata, expansa; concentrice crebre sed obtuse lirulata; umbonibus obtusis; intus, dentibus minoribus; linea pallii angulata, haud sinuata; cicatricibus adductoribus callosis; margine t. adulta postice altero alterum amplectante. (Carpenter.)

Shell small, sub-elliptical, gibbous, thick; beaks sub-central, small, inconspicuous; anterior extremity evenly rounded; posterior dorsal margin slightly arcuate, sloping down nearly to base, where it turns abruptly, forming an angular extremity; ventral margin arcuated, a sharp submarginal ridge extends from beak to lower portion of posterior extremity; surface sculptured with fine, but distant, concentric ridges; right valve with one prominent cardinal tooth in front of cartilage pit; left valve smaller, with a projecting cartilage process; pallial sinus slight; pedal scar distinct from adductor impression. (Arnold.)

TYPE locality, San Pedro or San Diego, California.

RANGE. Monterey, California, to Lower California. In the Pleistocene at San Pedro and San Diego, and the Pliocene at San Pedro, California.

Corbula luteola rosea Williamson, 1905.

Proc. Southern Cal. Acad. Sci., 4:120.

Shell same as the typical, but the disk of this variety is of a bright pink, excepting a ray of white from the beak across the umbonal portion; around the hinge area and the ventral margin the color is of a rosy flesh color; the interior of the valve is pink. (Williamson.)

TYPE in the Williamson Collection, Los Angeles Museum, Expositon Park. Type locality, Terminal Island, San Pedro, California.

RANGE. The same as the typical. A color form.

Corbula porcella Dall, 1916.

Proc. U. S. N. M., **52**:416.

Shell small, ashy white, inequivalve, the left valve smaller; inequilateral, the posterior end larger; rounded in front, pointed behind; a prominent angle separates the posterior dorsal area from the rest of the disk; surface concentrically evenly threaded, the threads a little more pronounced on the dorsal area; an obscure, almost microscopic, radial striation is sometimes apparent; the siphons protrude beyond the rostrum with a dense covering of wrinkled periostracum; interior white, hinge normal, the basal margin of the right valve partly overlapping that of the left valve; pallial sinus obsolete. Length, 8.5; height, 4; diameter, 4.5 mm. (Dall.)

TYPE in U. S. N. M., No. 97039. Type locality, Station 2838, off Lower California, in 44 fathoms.

RANGE. Santa Rosa Island, California, to Panama.

Corbula kelseyi Dall, 1916.

Plate 3, fig. 9.

Proc. U. S. N. M., **52**:416.

Shell rather large, rounded triangular, whitish, heavy, not inflated; the surface sculptured by low concentric lamellæ, a little more prominent near the posterior end of the shell, separated by equal or slightly wider interspaces crossed by fine radial threads which do not crenulate the lamellæ; there is no defined posterior dorsal area or keel; interior with a deep anteriorly rounded pallial sinus, fused with the pallial line below for the greater part of its length. There seems to be a small, narrow lunular area in the left valve. Length, 16; height, 10; diameter of left valve, 3 mm. (Dall.)

TYPE in U. S. N. M., No. 120691. Type locality, Catalina Island, California.

RANGE. Esteros Bay to Catalina Island, California.

Genus **GRIPPINA** Dall, 1912.

Shell slightly inequivalve, donaciform, small, with a well-marked, rounded, ascending pallial sinus; right valve receiving the dorsal edge of the left in grooves beneath its own dorsal margins; cardinal teeth two, large, sub-equal, prominent, horizontally produced and fitting under the beak of the left valve; resilium strong, compressed, situated between the two cardinals attached under the beak of the left valve, and having on its ventral surface a thin calcareous coating or ossiculum.

TYPE. *Grippina californica* Dall.

DISTRIBUTION. California.

Grippina californica Dall, 1912.

Plate 15, figs. 1, 2, 3.

Nautilus, **25**:128.

Shell minute, subtrigonal, whitish, solid for its size, finely concentrically sculptured; beaks moderately elevated, smooth; inner margins of the valves smooth, the left valve with no hinge plate; a narrow lanceolate lunule and sub-equal, similar escutcheon present; each bounded by a marked ridge; outside of the escutcheon a second radiating ridge extends from the beak to the lower posterior margin of the valves but without producing a notable angulation of the margin. Interior of the valves dull white, the muscular impressions and pallial line distinct. Length, 2.5; height, 1.5; diameter, 0.7 mm. (Dall.)

TYPE in U. S. N. M. Type locality, off San Diego, California.

RANGE. Known only from the type locality.

Family SAXICAVIDÆ.

Genus **PANOPÆA** Menard, 1807.

Shell equivalve, thick, oblong, gaping at each end; ligament external, on prominent ridges; one prominent tooth in each valve; pallial sinus deep. (Tryon. S. S. Conch.)

TYPE. *Mya glycimeris* Born.

DISTRIBUTION. Northern Seas, Mediterranean, Cape, Australia, New Zealand, Patagonia.

RANGE IN TIME. Inferior Oölite to the Pleistocene.

Panopæa generosa Gould, 1850.

Plate 2, figs. 1, 2.

Proc. Boston Soc. Nat. Hist., 7:215. *U. S. Exploring Expedition Shells,* figs. 507, 507a.

Shell large and ponderous, chalky white, of a somewhat quadrilateral form, the basal and hinge margins being nearly parallel; the posterior extremity broadly truncated, a very little obliquely, and the anterior extremity broadly rounded; anteriorly it gapes slightly, but posteriorly it gapes broadly, and the valves are here somewhat everted. The surface is coarsely undulated concentrically and covered by an obliquely, and somewhat plumosely wrinkled, dirty yellow epidermis. The beaks are sharp and prominent, placed near the middle of the superior margin; the anterior umbonal slope is tumid, the posterior a little compressed. The hinge is rather slender, having a single elevated, erect, obliquely triangular tooth in each valve, with a pit behind that in the right valve, and a crest-like

elevation for the attachment of the ligament behind them. Ligament external and double. Cavity of the beaks profound; muscular and pallial cicatrices broad and well impressed; posterior muscular scar but little broader than the pallial impressions; siphonal sinus shallow, small. Length, 6; height, 3; diameter, 4 inches. (Gould.)

TYPE locality, Nisqually, Puget Sound.

RANGE. Puget Sound to San Diego, California. In the Pleistocene at Santa Barbara and San Diego, and the Pliocene at Santa Barbara, San Fernando and San Pedro, California.

Panopæa generosa solida Dall, 1898.

Plate 3, fig. 11.

Trans. Wagner Inst., **3**, pt. **4**:831.

Shell thin, short, inflated, the beaks nearer the anterior end, which is expanded and rounded in the pedal region; posterior end narrower, opposite margins not parallel; posterior hiatus smaller than in the type and somewhat recurved; nymph narrow, slender, somewhat longer than in the type; pallial sinus small, wide. Length, 160; height, 120; diameter, 80 mm. (Dall.)

TYPE in U. S. N. M. Type locality, head of the Gulf of California.

RANGE. Strait of Juan de Fuca to the Gulf of California.

Genus **PANOMYA** (Gray) Adams.

Shell solid, large, irregular, with a single cardinal tooth under the beak in each valve; the pallial line of unconnected, rounded impressions; the animal larger than the shell, with large, united siphons, diverging slightly at the tips and covered with a wrinkled coriaceous epidermis; a burrower in mud and gravel, never perforating stones.

TYPE. *Mya norvegica* Spengler.

DISTRIBUTION. Northern Seas, Mediterranean, Cape, Australia.

RANGE IN TIME. Inferior Oölite, United States, Europe, India.

Panomya turgida Dall, 1916.

Proc. U. S. N. M., **52**:416. *Bull. U. S. N. M.*, **112**; pl. 2, fig. 1.

Shell very similar to the North Atlantic form but very much more capacious and larger. Length, 90; height, 60; diameter, 48 mm. (Dall.)

TYPE in U. S. N. M., No. 151224. Type locality, Popoff Strait in the Shumagin group, Alaska.

RANGE. Unalaska to the Shumagin Islands, Alaska.

Panomya beringiana Dall, 1916.

Proc. U. S. N. M., **52**:416.

Shell resembling *P. artica* Lamarck in a general way, but thinner, less cylindrical, much larger, and proportionately shorter. Length, 130; height, 80; diameter, 50 mm. (Dall.)

TYPE in U. S. N. M., No. 212875. Type locality, Station 3529, near Pribiloff Islands, in 56 fathoms.

RANGE. Eastern Bering Sea.

Panomya ampla Dall, 1898.

Plate 10, fig. 3.

Trans. Wagner Inst. Sci., **3**, pt. 4:883. *Proc. U. S. N. M.*, **24**:560; pl. 40, figs. 3, 4.

This differs from *P. norvegica* by its more heavy and rude shell, with a more expanded posterior region and flatter, more irregular valves. The shell is chalky white with a black, dehiscent, tarry periostracum, which is rarely preserved even in the living animal, which the valves only partially cover. (Dall.)

TYPE in U. S. N. M., No. 151221. Type locality, Aleutian region.

RANGE. Aleutian region to Puget Sound. In the Pleistocene of the North Pacific, Bering and Okhotsk seas.

Genus SAXICAVELLA Martens, 1885.

Shell equivalve, inequilateral, flaring, oval, transverse or sub-trapezoidal, obliquely angular in the rear; hinge becoming edentate or showing on the right valve, cardinal tooth, fitting into corresponding cavity in left valve; ligament short, prominent, pallial line gently sinuous, sinus very wide, not deep.

TYPE. *Mya plicata* Montagu.

DISTRIBUTION. Europe and west coast of North America.

Saxicavella pacifica Dall, 1916.

Proc. U. S. N. M., **52**:466.

Shell small, thin, white, with a pale olive, dehiscent, periostracum; inequilateral, the anterior end shorter and more attenuated, the posterior longer, more vertically expanded; surface sculptured only by incremental lines; a rounded ridge extends from the inconspicuous beak to the posterior basal margin, but there is no keel or angle; interior distinctly pearly, hinge as in the Atlantic species. Length, 5.8; height, 3; diameter, 2 mm. (Dall.)

TYPE in U. S. N. M., No. 209912. Type locality, Station 4356, off Point Loma, San Diego County, California, in 131 fathoms.

RANGE. Known only from the type locality.

Genus **CYRTODARIA** Daudin, 1799.

Shell oblong, gaping at each end; posterior side shortest; ligament large and prominent; hinge thick, without teeth; epidermis black, extending beyond the margins; anterior muscular scar long, pallial impression irregular, slightly sinuated. (Tryon. S. S. Conch.)

TYPE. *Cyrtodaria siliqua* Daudin.

DISTRIBUTION. Arctic Seas, Cape Perry, Northwestern America, Newfoundland.

Cyrtodaria kurriana Dunker, 1862.

Malak. Blatt., p. 38, 1861.

Testa lineari-oblonga, recta, tenuisculpta, postice valde hians concentrice striata obsoleteque plicata, epidermide cornea fusco-variegata obducta; umbones parum prominentes decorticati, submediani. Long., 35; alt., 40; crass, .28 mm. (Dunker.)

TYPE locality, West Coast of Greenland.

RANGE. Arctic Ocean and south to Norton Sound, Alaska. Also Greenland.

Genus **SAXICAVA** Fleuriau, 1802.

Shell when young symmetrical, with two minute teeth in each valve; adult rugose, toothless; oblong, equivalve, gaping, ligament external; pallial line sinuated, not continuous. It is found in crevices of rocks and corals, and amongst the roots of seaweed, or burrowing in limestone and shells. (Tryon. S. S. Conch.)

TYPE. *Mytilus rugosus* Linnæus.

DISTRIBUTION. Arctic seas, where it attains it largest size, Mediterranean, Canaries and the Cape.

RANGE IN TIME. Pleistocene and Miocene of Europe and United States and in all glacial deposits.

Saxicava arctica Linnæus, 1767.

Plate 9, fig. 6, and plate 51, fig. 4.

Syst. Nature, ed. 12, p. 1113. *Conch. Iconica;* pl. 1, fig. 1.

Shell oblong, rugose, thick posteriorly, spiniferous when young, with two teeth on the hinge; without teeth on the hinge when adult; anterior side narrow, short; ventral margin sinuous; umbos depressed, anterior; posterior side broader, square, biangular, broadly truncated. (Conch. Iconica.)

TYPE in British Museum. Type locality, Arctic.

RANGE. Arctic Ocean to Panama. Also Atlantic.

Saxicava pholadis Linnæus, 1771.

Plate 51, fig. 5.

Anim. s. Vertebres et Mantissa, 2:548. Sars, *Moll. Reg. Arct. Norv.*; pl. 20, figs. 7, a–b.

Shell elongated, rather mytilus-shaped, concentrically, strongly wrinkled; anterior side very short, rather narrow; posterior side more expanded, elongated, obliquely angular; dorsal margin straight; terminal margin broadly truncated; ventral margin convex. (Conch. Iconica.)

TYPE in British Museum. Type locality, Greenland.

RANGE. Arctic Ocean to Panama. Also Atlantic.

Family PHOLADIDÆ.

Genus **BARNEA** (Leach) Risso, 1826.

Shell oval-oblong, anteriorly gaping, a single lanceolate dorsal accessory valve; umbonal process reflexed, closely applied. (Tryon. S. S. Conch.)

TYPE. *Pholas candida* Linnæus.

DISTRIBUTION. Australia, Burma, Red Sea, Europe, Patagonia, Philippines, United States, Norway, India, Western Africa, Crimea.

RANGE IN TIME. Eocene. United States and Europe.

Barnea pacifica Stearns, 1871.

Plate 21, figs. 2, 3, 4.

Prel. Descr., Aug. 1871, p. 1. *Proc. Cal. Acad. Sci.,* 5:81; pl. 1, figs. 6, 6, a–c, 1873.

Shell oblong, beaks two-fifths the length of shell from anterior end; anterior end of valves triangular, pointed; anterior dorsal edge of valves reflected and folded down on the umbos; lower anterior margin curved, forming a large elliptic-oval gape; posterior end of the valves squarely rounded; shell dull, chalky white, sculptured in concentric lines, which anteriorly are laminated and posteriorly become extinct; valves radiately ribbed, which also become obsolete at the posterior end; at the intersection of the radiating and concentric lines the sculpture is pectinated; an area below the umbos, nearly or quite destitute, which varies much in prominence in different specimens; accessory plate sub-lanceolate and bent down on the beaks; anteriorly prolonged over but not covering the ante-umbonal gape; interior of valves white, enamelled; internal rib short, curved and flattened. Length, 2$\frac{6}{10}$; height, 1$\frac{5}{10}$ inches. (R. E. C. Stearns.)

TYPE in U. S. N. M. Type locality, San Francisco Bay, California.

RANGE. San Francisco Bay to Lower California.

Genus **ZIRFÆA** (Leach) Gray, 1847.

Shell oval, cardinal margin scarcely reflected, no accessory valves, the beaks protected by a membrane; usually a thin fugacious epidermis; anteriorly greatly gaping. (Tryon. S. S. Conch.)

Shell with a radial sulcus dividing the valves into two areas; accessory plates rudimentary or wanting; anterior gape large. (Dall.)

TYPE. *Pholas crispata* Linnæus.

DISTRIBUTION. Europe, United States, Senegal, Straits of Sunda, Japan.

Zirfæa gabbi Tryon, 1863.

Plate 36, fig. 1.

Proc. Acad. Nat. Sci. Phila., **15**:144; pl. 1, fig. 1.

Shell large, transverse, obliquely divided by a deep furrow proceeding from the umbonal apex to the basal margin and forming a corresponding rib on the internal surface of the valve. Posteriorly to the furrow the shell is marked only by growth lines which, in crossing it, are elevated into sharp ribs, in which character they are continued to the anterior margin. The portion of the shell anterior to the radiating furrow is ornamented with numerous longitudinal ribs, approximating in pairs and rendered acutely scabrous at the intersection of the rib-like growth lines. Ventral anterior margin emarginate. Dorsal anterior margin reflected and closely appressed over the beaks. Posterior dorsal margin declining somewhat to the quadrately rounded posterior lateral end. Color white. Length, 1¼ inch; breadth, 1½ inch; breadth anterior to furrow, 9/10 inch, posterior to the furrow, 1½ inch. (Tryon.)

TYPE in Acad. Sci. Phila. Type locality given by W. M. Gabb as Japan.

RANGE. Bering Sea and islands south to San Diego, California. Also Japan. In the Pleistocene at San Pedro and Santa Barbara, California.

Genus **PARAPHOLAS** Conrad, 1848.

Shell oval-oblong; anterior gape closed by a thin, swollen, globose, callous plate; valves equal, divided by two radiating grooves into three portions; two dorsal valves.

TYPE. *Pholas californica* Conrad.

DISTRIBUTION. California, Australia. Fossil, Cretaceous.

RANGE IN TIME. From the Cretaceous.

Parapholas californica Conrad, 1837.

Plate 22, figs. 7, 13, and plate 36, figs. 2a, 2b.

Jour. Acad. Nat. Sci. Phila., **7**:236; pl. 18, fig. 5.

Shell elongated, with eight accessory valves, two of which are on the basal margin, extending nearly its entire length; anterior side gibbous,

with the concentric lines lamellar, crowded, undulated and crossed by numerous impressed lines; valves much contracted sub-medially, with an oblique groove; umbonal slope angulated; posterior side with elevated laminæ; extremity truncated; apophysis oblique, dilated; hinge margin within greatly thickened posteriorly. Length, 4 inches. (Conrad.)

TYPE locality, San Diego, California.

RANGE. Monterey to San Diego, California.

Genus **PHOLADIDEA** Turton, 1819.

Shell globose-oblong, with a transverse furrow; anterior gape large, closed in the adult by a callous plate; two minute accessory valves in front of the beaks. (Tryon. S. S. Conch.)

TYPE. *Pholadidea loscombiana* Goodall.

DISTRIBUTION. Britain, New Zealand, Ecuador, West Coast of United States.

Pholadidea penita Conrad, 1837.

Plate 21, fig. 10, and plate 51, figs. 3a, 3b.

Jour. Acad. Nat. Sci., Phila., 7:237; pl. 18, fig. 7.

Shell ovate, elongated, contracted sub-medially and grooved; anterior side inflated, with decussating lines, the radiating striæ having a granulated appearance, posterior side sub-cuneiform, extremity truncated, with a membranous expansion or appendage; apophysis oblique, slender, spoon-shaped at the extremity. (Conrad.)

TYPE locality, near San Diego, California.

RANGE. Chirikoff Islands, Alaska, to San Pedro and San Diego, California.

Pholadidea penita concamerata Deshayes, 1839.

Plate 22, figs. 4, 5.

Rev. Zool. Soc. Cuvierienne, p. 324. Guerin, *Mag. Zool.* 1840, *Mol.*, pl. 17.

Shell ventricose, closed, obliquely divided; anterior part inflated, radiately ribbed, ribs imbricated, dorsal margins widely reflected; posterior part striated, sub-quadrate at the end, produced into a horny cup divided at the sides; a large sub-quadrate, posteriorly acuminated sub-quadrate lamnia at the umbos, then two wide laminæ confluent with the terminal margins of the shell. (Conch. Iconica.)

TYPE in British Museum. Type locality, Monterey, California.

RANGE. Bering Sea and Islands to San Diego, California. In the Pleistocene at Santa Barbara and Harris's Ranch, Santa Barbara County and San Pedro, California.

Pholadidea penita sagitta Stearns, 1916.

Proc. U. S. N. M., **52**:417.

Shell closely similar to *P. penita* Conrad, but with shorter proportions, measured longitudinally, and with a corresponding widening of the dorsal appendages of the adult. (R. E. C. Stearns.)

TYPE in U. S. N. M., No. 63312. Type locality, Monterey, California.

RANGE. Puget Sound to Socorro Island.

Pholadidea melanura Sowerby, 1834.

Plate 22, figs. 9, 10.

Proc. Zool. Soc., p. 70. *Thes. Conch. Pholas*, pl. 107, figs. 78, 79.

Shell closed, sub-ovate, divided in the middle by a serrated canal; anterior part with imbricated ribs; ventral margin smooth inflated, confluent with the back, dorsal margin strongly reflected and tumid, divided at the umbos by two sub-quadrate shields placed upon wide laminæ; posterior part concentrically ridged, with a blackish epidermis, and at the end two horny, inflated sub-reniform swellings fixed to the shelly tube. Long., 1.4; lat., 0.75; alt., 0.08 poll. (Sowerby.)

TYPE in British Museum. Type locality, Monte Cristo, Colombia.

RANGE. Redondo, California, to Colombia.

Pholadidea ovoidea Gould, 1851.

Plate 21, figs. 5, 6, and plate 51, figs. 1a, 1b, 2a, 2b.

Proc. Boston Soc. Nat. Hist., **4**:87. *Boston Jour. Nat. Hist.*, **6**; pl. 15, fig. 1.

Shell ovoid, rather solid, chalky white, very widely gaping behind the beaks which are placed at the anterior fourth of the shell, slightly gaping also in front, the anterior ventral opening mostly closed by thick calcareous plates, one of which partially overlaps the other, somewhat marked by converging ridges; both extremities broadly rounded; disk of the valves divided by a broad sulcus barred by the lines of growth, and passing from the beaks to the middle of the ventral margin; posterior portion unsculptured; anterior portion ornamented with crowded, elevated, undulated concentric laminæ, decussated by acute, radiating ribs arranged somewhat in pairs; in front of the beaks the dorsal margin is reflected, not appressed, and then doubled upon itself; cardinal valvulæ missing; interior yellowish white; cardinal apophysis long, slender, a little expanded and excavated toward extremity, directed obliquely backward. An extensive prolongation of the epidermis closes the posterior margins and forms a long tube for the protection of the siphons. Length, 3; height, 2; diameter, 1¾ inches. (Gould.)

TYPE locality, California.

RANGE. Bering Sea to the Gulf of California.

Pholadidea parva Tryon, 1865.

Plate 22, figs. 11, 12.

Amer. Jour. Conch., 1:39; pl. 2, figs. 4, 5.

Shell small, ovate, inflated, rather thick. Surface divided by an oblique impressed rib, posteriorly to which it is concentrically striate while anteriorly it is radiately ribbed. The flexed dorsal margins are each covered with a thick, irregularly shaped accessory valve, with a single central valve posterior to them. The latter is somewhat pentagonal, emarginate in front. Hiatus filled by a heavy callus, which juts out somewhat into a point or beak, instead of preserving a rounded outline. Length, 0.33; height, 0.50; diameter, 0.30 of an inch. (Tryon.)

TYPE in Tryon's Cabinet. Type locality, Lower California, in *Haliotis*.

RANGE. San Pedro, California, to Lower California.

Subgenus NETTASTOMELLA Carpenter.

Pholadidea rostrata Valenciennes, 1846.

Plate 13, figs. 10, 11, and plate 38, figs. 7, 10.

Voyage of Venus, Atlas, pl. 24, figs. 4, 4a. Marine shells of Puget Sound, p. 66. 1924.

Shell small, short, widely gaping anteriorly, sculpture radiately scabrous, divided by a constricted deep groove; behind the groove concentrically ridged; anterior portion with fine concentric ridges which continue around the aperture, curved up to the umbos, thus forming an inverted U-shaped opening. The valves at the posterior end are prolonged like a duck's bill. It differs from *Jouanettia* in having the valves equal, and from *Pholadidea* s.s. in that the ends are shelly and prolonged, instead of a cornaceous cup. A very delicate thin shell, of a pure white color. Found living in the shale with other species of Pholads. Valenciennes figured and named the shell but did not publish a description. Length of adult specimen figured about 28 mm. (Oldroyd.)

I have given Valenciennes' figure of his type on plate 13, figs. 10, 11. This has been wrongly called *P. darwini*, a South American species. *P. darwini* is figured on plate 42, figs. 7, 8.

TYPE locality and location of the type not known to the present writer.

RANGE. Vancouver Island, British Columbia, to San Diego, California.

Genus **MARTESIA** (Leach) Blainville, 1824.

Valve lengthened behind when full-grown, by a plain border; umbonal valves one or two, dorsal and ventral margins often with narrow, accessory valves; surface impressed with one or more furrows. *M. striata* burrows in hard timber; *M. teredinifórmis* was found in cakes of floating wax on the coast of Cuba; *M. australis* in (fossil?) resin, on the coast of Australia;

M. rivicola in timber twelve miles from the sea; in Borneo (fresh water). (Tryon. S. S. Conch.)

TYPE. *Pholas striata* Linnæus.

DISTRIBUTION. World wide.

RANGE IN TIME. Cretaceous, Pleistocene.

Martesia xylophaga Valenciennes, 1846.

Voy. Venus, Atlas, pl. 24, fig. 2.

Valenciennes named and figured this species, but did not describe it. This may prove on further study to be the same as *M. striata* Sowerby. No material is available upon which to base a description.

TYPE locality, somewhere on the Pacific Coast.

RANGE. San Francisco, California, to Panama.

Martesia intercalata Carpenter, 1855.

Mazatlan Cat., No. 19:13.

M. t. parva, subglobosa, in duas partes divisa; parte anteriore tenuissime concertice striata, radiis longitudinalibus subobsoletis vix undata; in juniore maxime hiante, margine solido; in adulta secretione semi-cornea clausa: parte postica sublævi, epidermide copiose induta, margine rotundato; umbonibus testa reflexa adhærente cælatis; clypeo pyriforme, parvo, solido, inter secretiones valvarum intercalante; partibus ventrali et dorsali laminis semi-corenis, brevibus, a calyce repulsis; calyce plano, brevi, simplici, extante. Long., .34; lat., .35; alt., .33. (Carpenter.)

TYPE in British Museum. Type locality, Mazatlan, in *Spondylus.*

RANGE. Farallon Islands to Mazatlan, Mexico.

Genus **NAVEA** Gray, 1851.

Shell sub-globose, closed behind; anterior gape very large, not closed up by age; edge reflected, crenulated; valves with a sunken sub-central rib; anterior dorsal edge reflected and closely appressed to the outer surface of the valve; dorsal muscles covered with a coriaceous periostracum, and with a small, transverse posterior valve placed behind the umbos; internal process simple, elongate, arched.

TYPE. *Navea subglobosa* Gray.

DISTRIBUTION. California.

Navea subglobosa Gray, 1851.

Ann. Mag. Nat. Hist. (2), **8**:385. Chenu, *Man.,* **2**:6, figs. 28, 29.

Shell sub-globose, solid, truncated in front; anterior portion radiately ribbed and with a reflected undulated edge, hinder portion regularly, concentrically grooved. (Gray.)

TYPE in Cabinet Gray. Type locality, California in a shell.

RANGE. Lobitas to Monterey, California.

Genus **XYLOPHAGA** Turton, 1822.

Shell globular, with a transverse furrow; gaping in front, closed behind; pedal processes short and curved; anterior margins reflected, covered by two small accessory valves; burrow oval, lined with shell. (Tryon. S. S. Conch.)

TYPE. *Xylophaga dorsalis* Turton.

DISTRIBUTION. Norway, Britain, Western North and South America, Mergive Island. Bores an inch deep, and across the grain, in floating wood and timbers which are always covered by the sea.

RANGE IN TIME. Tertiary.

Xylophaga mexicana Dall, 1908.

Bull. Mus. Comp. Zool., **43**:425.

Shell small, short, posterior area rounded behind, concentrically marked only with incremental lines; median furrow wide, channelled, in the adult bounded behind by a flattened thread; in front the elevated margin of the channel is obliquely serrate by the termination of the sagittate sculpture of the anterior area, which a little more anteriorly becomes very fine, so as to require strong magnification to bring out its character; anterior margin of the valves with a rectangular sulcus, from whose apex an impressed line proceeds to the umbo, the angulation of the sculpture resting on this line; anterior auriculation small; anterior dorsal margin strongly reflexed; interior smooth except for a strong, flattish rib which extends from the umbo under the middle of the wider external channel; umbo much incurved; myophore small and slender. Length, 4.2; height, 5.2; diameter, 4 mm. (Dall.)

TYPE in U. S. N. M. Type locality, U. S. S. "Albatross," Station 3422, off Acapulco, Mexico, in 141 fathoms.

RANGE. Monterey, California, to Acapulco, Mexico.

Xylophaga californica Bartsch, 1921.

Proc. Biol. Soc. Wash., **34**:32.

In *Xylophaga californica* there are about 14 denticulated ridges to a millimeter in the center of the posterior area, and the denticulated ridge bearing posterior median portion is .7 mm. in width at the angle of junction of the posterior with the median part. Type measures, length, 4.9; altitude, 4.7 mm. (Bartsch.)

TYPE in U. S. N. M., No. 209876. Type locality, Pt. Pinos Light, California, U. S. S. Albatross Station 4525.

RANGE. California.

Xylophaga washingtona Bartsch, 1921.

Proc. Biol. Soc. Wash., 34:32.

In *X. washingtona* there are about ten denticulated ridges to a millimeter in the center of the posterior area, and the denticulated ridge bearing posterior median portion is 1.2 mm. in width at the angle of junction of the posterior with the median part. Type measures, length, 5.7; altitude, 5.5 mm. (Bartsch.)

TYPE in U. S. N. M., No. 344479. Type locality, San Juan Island, Washington.

RANGE. Puget Sound, Departure Bay, British Columbia, and off Oregon and Washington coasts.

Family TEREDIDÆ.

Genus **BANKIA** Gray, 1840.

The genus is characterized by having the pallets consisting of a series of cone-in-cone structures, which give to them the appearance of an ear of wheat. (Bartsch.)

TYPE. *Teredo bipalmulata* Lamarck.

DISTRIBUTION. Universal.

RANGE IN TIME. Found in fossil woods in the green sand of England.

Subgenus BANKIA Gray.

Bankia setacea Tryon, 1863.

Proc. Acad. Nat. Sci. Phila., p. 144; pl. 1, figs. 2, 3. Bartsch, *U. S. N. M. Bull.*, 122:7; pls. 4, 5, and 30, fig. 3.

Shell very large, sub-globose, white, excepting the anterior median portion, which has a rosy flush, a faint suffusion of which also extends over the anterior part. The anterior part has a strong sinus at the extreme anterior margin, which is covered with a thick callus that is reflected partly over the exterior, where it forms a pronounced crest. The anterior part is marked by strong rib-like dental ridges which expand slightly fan-shaped from the anterior margin to the posterior termination; forty-three of these ridges occur on the specimen figured. These ridges are more distantly spaced on the early parts of the shell (the part nearest the umbo) than on the latter, becoming successively closer-spaced as the shell advances in age. In the early portion they are about twice as wide as the ridges, while in the latter part they are scarcely as wide as the ridges. The spaces between the ridges are marked by fine striations which coincide with the ridges. These markings are best shown on the younger portions of the shell. The ridges have their margins minutely denticulated. In cross section they would appear triangular, with the dorsal side about

one-third as long as the ventral. The anterior median part is marked by rather broad, strongly denticulated ridges which join those of the anterior part in a little more than a right angle. The junction of the anterior dental ridges and those of the posterior-median part form a well-impressed line which extends from the ventral margin to the umbos. The spaces separating the dental ridges on the anterior median portion are mere impressed lines. The anterior half of the median portion is convex, while the posterior half is depressed, forming a groove. Both parts are crossed by rough, cord-like incremental lines, which follow a more or less sinuous course. The posterior portion of the median part is about as wide as the anterior and the median portion taken together, and is crossed by oblique, somewhat wrinkled lines of growth. The posterior part forms a strong auricle, which is thin, decidedly expanded and slightly reflected at the margin, and emarginate at the umbonal terminus. The interior is bluish white. The umbo marks a strong knob from the underside of which the broad blade projects for a little more than half the length of the shell. The ventral portion of the median part bears the usual strong knob. The anterior and the median part show a strong tumid area at their junction, while the median portion of the middle part is concave. The posterior part projects over the posterior median parts as a strong shelf. This part in cross section would show a decidedly sinuous outline. The emargination of the dorsal portion of the auricle shows best when seen from within. The pallets form long, plume-like elements composed of a series of cup-in-cup structures, which project at the lateral margin in the form of strong awns. Each cup is covered by a thin periostracum which is faintly fimbriated at the distal end, and marked by longitudinal striations. The stalk is about one-fourth the length of the entire pallet. Height, 11; length, 12.5; diameter, 11 mm. The pallet measures, entire length, 32.5; length of stalk, 7.5; diameter, 3.7 mm. (Bartsch.)

TYPE in U. S. N. M., No. 102762. Type locality, San Francisco Bay, California.

RANGE. Unalaska to San Francisco, California.

Genus **TEREDO** Linnæus, 1753.

In this genus the pallets are either paddle- or spoon-shaped. They may be distally cupped or not, or they may even bear a calcareous knob at the terminal portion. (Bartsch.)

TYPE. *Teredo navalis* Linnæus.

DISTRIBUTION. Norway, Britain, Black Sea, Tropics, Atlantic and Pacific Coast of America.

RANGE IN TIME. From the Lias. United States, Europe.

Subgenus Teredo Linnæus.

Teredo beachi Bartsch, 1920.

Proc. Biol. Soc. Washington, **34**:29, 30.

Shell subglobular, with a strong posterior auricle. Exterior milk white, excepting the umbos and a streak in the median middle portion, which are rose colored; interior bluish white. The anterior portion forms a deep sinus, which is bordered by a narrow smooth edge, the external margin of which is reflected over the anterior portion as a smooth callus, which is translucent and permits the dental ridges covered by it to be seen through it. The dental ridges radiate from this anterior smooth portion fan-shaped backward over the rest of the anterior area. There are about thirty-five of these in the type, although some of the earlier ones may have been lost through the erosion of the umbos. The dental ridges, which are finely denticulated at their free margin, are about one-third as wide as the flattened spaces that separate them at the junction of the anterior with the median portion. The flattened interspaces are finely striated, the striations coinciding with the dental ridges. The dental ridges of the anterior portion meet those of the anterior median portion at almost right angles. The dental ridges of the anterior median portion are closely crowded, being separated by a mere line only. They are very strongly denticulated. The middle median portion is a somewhat depressed area, which extends from the umbo to the ventral margin. There is a strongly impressed line marking the center of this area, which is crossed by rather rough, curved incremental lines which extend equally rough over the posterior median portion. The posterior portion forms a strong auricle, which is marked by rough lines of growth. The interior has the umbos strongly curved inward, forming a prominent knob, from the inside of which a strong, broad, thin blade extends, which maintains almost an equidistance from the inside of the shell throughout its entire length, the broad side of the blade being placed obliquely to this. The junction of the anterior and median portion is marked by a slightly thickened ridge on the inside. The center of the median portion is marked by a roughened area which extends from the umbos to the ventral margin, where the usual strong knob is present. The auricle extends over the posterior median portion and forms a narrow, thin, free shelf, with very little of a cavity behind it. The auricle is marked by strong, curved lines of growth. The pallets are spatulate, very short stalked and very broad, the distal portion being decidedly hollowed out, almost suggesting a basal joint of *Bankia.* Type measures: height, 5.5; length, 6; diameter, 7 mm. (Bartsch.)

Type in U. S. N. M., No. 341155. Type locality, San Pablo Bay, California.

Range. California?

Subgenus Teredops Bartsch.

Teredo diegensis Bartsch, 1916.

Nautilus, **30**, No. 4:48. *Bull. U. S. N. M.,* **112**; pl. 22, fig. 3; pl. 34, fig. 3.

Shell small, sub-globular, white. The anterior area rather heavy, with the usual sinus which is edged with a strong callus slightly reflected over the back of the shell, from which it is not strongly differentiated. The rest of the anterior area is marked by dental ridges which have a strong downward flexure a little distance from the anterior edge, and then bend in an even curve backward, expanding slightly fan-shaped. These ridges are almost as wide as the spaces that separate them. There are 53 present in the type. They seem to slope almost as abruptly on the ventral side as on the dorsal, and are very finely denticulated on the free margin. The anterior median portion of the middle part is crossed by strong dental ridges which are separated by mere impressed lines and very strongly denticulated at the free edge. They join those of the anterior part at right angles. The junction between the anterior and median part is a slightly depressed groove which is crossed by rough wrinkles. The posterior portion of the median part is about as wide as the anterior and is marked by strong lines of growth. The posterior part forms a minute auricle which is marked by a series of obsolete corrugations which parallel the ventral margin. Interior bluish white. The junction of the anterior and the posteror portion is marked by a tumid cord. The auricle extends over the posterior median portion as a narrow shelf. The umbo has a strong knob from which a broad, curved and somewhat flexed blade extends for a little more than half the width of the shell. The ventral margin of the median portion bears the usual knob. The pallet has a sinuous, cylindric stalk. The blade is sub-cordate in shape. The distal portion is drawn out. The distal two-thirds are covered by a strong periostracum, the outer portion of which bears a strong calcareous knob at the tip. Height, 4.7; length, 4.4;; diameter, 4.6 mm. (Bartsch.)

Type in U. S. N. M., No. 74219. Type locality, San Diego, California.

Range. San Diego to San Francisco Bay, California.

Subgenus Lyrodus Gould.

Teredo townsendi Bartsch, 1922.

Bull. U. S. N. M., **122**:26; pl. 22, fig. 2, pl. 33, fig. 2.

Shell small, sub-globular, white. The extreme anterior part with a strong sinus covered by a heavy callus, which is reflected over part of the outer portion as a thin callus, through which the dental ridges may be seen. These bend suddenly downward at the anterior margin, and then spread fan-shaped backward, being separated by spaces about three times

as wide as the ridges. These ridges slope abruptly on the dorsal side and much more gently on the ventral, the ventral side being about twice as long as the dorsal. Of these ridges, which are finely denticulated at their free margin, 22 are present in the type. The anterior median area is quite narrow and marked by dental ridges bearing rather prominent tubercles. These dental ridges join those of the anterior part at almost a right angle. The middle median portion forms a depressed groove which is crossed by rough U-shaped curved wrinkles. The posterior portion is a little wider than the anterior and median portion combined, and is marked by a series of wave-like markings, between which finer lines of growth are present. The posterior part forms a conspicuous triangular auricle, which is rather large and not strongly separated, though somewhat constricted at its junction with the posterior median portion. The interior is bluish white. The junction of the anterior and median portions is marked by a raised thread. The median portion is a roughened groove at the basal termination of which the ventral knob is placed. The posterior part projects over the posterior median portion as a conspicuous shelf. The free auricular portion is marked by concentric lines of growth. The umbo has a strong knob, from the basal portion of which a narrow blade extends down through about half the length of the shell. Pallets paddle-shaped, rounded at the distal end, which is surmounted by two strong periostracal prongs, which form a forked tip. The distal half of the outside, which is rounded, is covered by a periostracum. The inside is slightly concave, the distal half also having a thin brown periostracum. Height, 4.1; length, 4.1; diameter, 4.1 mm. (Bartsch.)

TYPE in U. S. N. M., No. 344665. Type locality, Shaw-Batcher Shipyard, South San Francisco, California.

RANGE. Known only from the type locality.

CLASS BRACHIOPODA

Family LINGULIDÆ.

Genus **GLOTTIDIA** Dall, 1870.

Shell linguiform, elongate, pedunculated; general character as in *Lingula*. Neural valve provided internally with two sharp, narrow, incurved laminæ, diverging from the beak and extending about one-third the length of the shell; anterior extremities of the laminæ about midway between the mesial line and the margin. Hæmal valve with a mesial septum of about the same length extending forward from the beak. Anterior adductor impressions rounded, separated by a faint mesial ridge, faintly impressed. Scar of the post adductor close in the cavity of the beak, rounded. No other evident scars. Shell smooth, perforate or imperforate. (Dall.)

TYPE. *Glottidia albida* Hinds.

DISTRIBUTION. East and west coasts of North America.

Glottidia albida Hinds, 1844.

Plate 49, fig. 3.

Hinds, *Zool. Voy. Sulphur, Mollusca,* p. 71; pl. 19, fig. 4, 1844.

Shell elongately oval, smooth, rather flat, everywhere whitish, shining; valves closed throughout. (Hinds.)

TYPE in Museum Cuming. Type locality, Magdalena Bay, Lower California.

RANGE. Monterey Bay to San Diego, California, and Magdalena Bay, Lower California.

Glottidia palmeri Dall, 1871.

Amer. Jour. Conch., 7:77.

Shell imperforate; texture moderately solid but contracting about the edges in drying; very narrow and elongated, rather square in front. Beaks sharply acuminated, valves in the natural condition rather widely gaping. Hæmal valve with a small concave area, transversely striated. Exterior of the valve with two obscure carinæ extending from the beaks to the anterior corners of the shell, and another, even less evident, in the medial line. The posterior portion of the shell creamy white, extreme edges lightly horny; area between the two carinæ of a fine brown, stronger on the lines of growth and diminishing posteriorly; median carina paler. Surface polished, with obscure impressed lines and slight rugosities under the lens.

Interior whitish, not polished. When fresh all organs are represented in a faint impression on the inner surface, but this becomes obscure when the shell is contracted by drying. Internal laminæ prominent. In all the specimens of this genus which I have seen the right lamina in the neutral valve is a little longer than the other.

The muscles are attached on the inner concave edges of the laminæ. The muscular impressions are very small and obscure. Length of shell, 1.7 inches; greatest width, 0.55 inches. Length of peduncle, 4.5 inches. (Dall.)

TYPE in U. S. N. M. Type locality, head of Gulf of California.

RANGE. San Pedro, California, to head of Gulf of California.

Genus **DISCINISCA** Dall, 1871.

Lower valve more or less flattened, concave or compressed, upper valve more convex; apices of both subcentral or subposterior; lower valve with a small septum, as in *Discina,* behind which is a disk or area impressed from the outside, and traversed by a longitudinal fissure in the median line of the valve; shell more or less horny in texture, minutely tubulous. (Dall.)

DISTRIBUTION. West coast of North and South America, Japan, China, Nicaragua, Brazil, Jamaica, Philippines. Fossil, Silurian to recent.

TYPE. *Discinisca lamellosa* Broderip.

Discinisca strigata Broderip, 1833.

Plate 49, figs. 4, 5.

Trans. Zool. Soc., 1:143; pl. 23, fig. 1.

Orb. testa crassiuscula, subrotunda, substriata, radiatim castaneo strigata; epidermide tenui, fusca. Long., 7/12; lat., vix 7/12; crass., 2/12 poll. (Broderip.)

Mr. Cuming dredged two individuals of this species at the depth of 18 fathoms. They were attached to rocks. The dimensions are taken from the largest specimen; but the smallest is figured on account of the superior brilliancy of the stripes. (Broderip.)

TYPE in Museum Cuming. Type locality, Cana Island, Guatemala, 18 fathoms.

RANGE. San Pedro, California, to Margarita Bay, Lower California; Mazatlan; Nicaragua; Panama.

Family RHYNCHONELLIDÆ.

Genus **HEMITHYRIS** Orbigny.

Pal. Franc. Ter. Cret., 4:342, 1847.

Shell trigonal, acutely beaked, usually plaited; dorsal valve elevated in front, depressed at the sides; ventral valve flattened, or hollowed along

the centre, hinge plates supporting two slender, curved lamellæ; dental plates diverging. The foramen is at first only an angular notch in the hinge line of the ventral valve, but the growth of the deltidium usually renders it complete in the adult shell. (Tryon S. S. Conch.)

TYPE. *Anomia psittacea* Gmelin.

DISTRIBUTION. Labrador, Hudson's Bay, Melville Island, Sitka, Icy Sea, New Zealand.

RANGE IN TIME. Lower Silurian; North and South America, Europe, Thibet, China.

Hemithyris psittacea Gmelin, 1792.

Plate 16, figs. 8, 9, 10, 11, 12.

Gmelin, *Syst. Nat.*, **2**:3348.

Shell somewhat triangular, globose, broadest anteriorly, tapering posteriorly; lateral margins rounded. Dorsal valve inflated, especially at the umbo, more or less divided into three lobes, of which the central one forms a mesial fold, scarcely defined in some specimens, much more so in others; front line nearly straight or three-lobed. Ventral valve much less convex than the dorsal one, rather flattened, with a broad, channelled, flattened, longitudinal, mesial sinus; beak sharply pointed, incurved, under which is situated an incomplete elongated foramen, margined anteriorly by the umbo, and laterally by triangular, deltidial plates; beak ridges not sharply defined; lateral margins of the valves sinuous, curved in front. Surface of valves radiately and finely striated. Shell structure fibrous. Valves strongly articulated by curved teeth in the ventral valve, fitting into sockets in the dorsal one. Hinge plate in the dorsal valve deeply divided, supporting two short, flattened, grooved and curved lamellæ. At the bottom of the dorsal valve are seen the quadruple muscular impressions left by the adductor or occlusor muscles, each pair being separated by a short medio-longitudinal ridge. In the interior of the ventral valve the teeth are supported by dental plates extending to the bottom of the valve, and at their base a semi-circular ridge on either side encloses a saucer-shaped depression in which are situated the muscular scars. Close under the beak the peduncular muscles leave a small scar; lower down and toward the centre of the valve is situated a divided, heart-shaped scar, due to the adductor or occlusor muscles; and on each side of these are situated, one above the other, the divaricator and ventral adjuster muscular impressions. Colour bluish or a brown black. Length, 1 inch, 3 lines; width, 1 inch, 1 line; depth, 9 lines. (Davidson.)

TYPE in British Museum? Type locality, Mari Groenlandiæ.

RANGE. Arctic Sea, Greenland, Spitzbergen, Norway, Shetlands, Hebrides, Orkneys, Northumberland coast, Labrador, Gulf of St. Law-

rence, off Newfoundland, off Halifax, off Nova Scotia, Gulf of Maine, George's Banks, Atlantic. Seahorse Islands, Arctic. Bering Strait, St. Paul, and St. George, Islands, Puget Sound, and Astoria, Pacific.

Genus **FRIELEIA** Dall, 1895.

Shell resembling *Hemithyris* Orbigny, from which it is distinguished by having the inner upper margins of the crura extended toward each other and united to the upper edge of a rather prominent, median septum, forming a spondylium, and in having the branchia consisting of a much smaller number of coils. (Dall.)

TYPE. *Frieleia halli* Dall.

DISTRIBUTION. West coast of North America.

Frieleia halli Dall, 1895.

Proc. U. S. N. M., 17:714; pl. 24, figs. 6, 9–13.

Shell of moderate size, thin, translucent, yellowish gray, dorsoventrally somewhat compressed, slightly impressed in the median line below, but the basal margin hardly, if at all, flexuous; surface smooth, polished, except for faint, irregular radial markings and delicate incremental lines, occasionally modified by accidents of growth; pedicle valve pointed above, rounded at the lower corners, with a sharp, short beak slightly recurved, below which is a nearly circular peduncular orifice, bounded below by two well-marked sub-triangular deltidial plates, which do not quite meet in the median line; cardinal margin below them evenly arched and passing without an angle into the lateral margins of the valve, which for some distance are almost straight; the margins then round evenly into the base, which in many specimens is nearly straight, in others slightly excavated mesially; the margins are almost entirely in one vertical plane; teeth much as in *Hemithyris psittacea,* short, stout, projecting at right angles to the plane of the valve margins, and slightly recurved below; supported by slender buttresses which rise from the valve and extend upward into the cavity of the beak, leaving narrow recesses between the buttress and the side of the valve; in the interior of the beak there is no mesial septum, and the thinness and translucency of the polished valve are such that hardly any trace of muscular impressions is left on the shell; these impressions, if visible, would extend only three-fourteenths of the distance from the cardinal margin toward the base of the valve, while in *H. psittacea* the proportion is about eight twenty-firsts; the interior of the valve under moderate magnification shows with great clearness the reticulated outlines of the prisms of shelly matter forming the internal layer of the shell, but there are no other internal markings; brachial valve hardly less inflated than the other, roundly pointed above, with a well-defined, slender, sharp-

edged medial septum extending six-fifteenths of the distance from the cardinal apex toward the base; teeth long, diverging at an angle of about 120°, obliquely transversely striated, the sockets behind them deep, internally transversely grooved; lamella supporting the teeth deep-seated, extending obliquely from the sides of the valve; crura starting from the cardinal margin at the inner ends of the teeth, extending in a straight line obliquely downward and forward, united to the teeth for about half the whole length by an excavated lamina; the free ends of the crura slightly wedge-shaped, parallel-sided, and abruptly truncate at the ends. From the upper part of the inner edges of the crura on each side an excavated lamina is given off, which reaches the median line above the septum, to which, and to each other, the laminæ are solidly attached, forming a narrow spondylium. The front edge of the spondylium is indented mesially and there is an impressed mesial line, extending upward, on each side of which, in old specimens, the laminæ are made prominent by a callous deposit. Behind the spondylium the attached surface of the septum is widened, so as to support part of each lamina as well as their line of junction. On either side of the septum, between it and the supporting dental lamina, a pointed recess extends below the spondylium toward the cardial margin. The surface of this valve, like that of the other, is too polished to retain much of the muscular impressions. The muscles, however, are inserted on each side of the septum and above its lower end, much as in *H. psittacea*. An average specimen measures 17 mm. high, 16 mm. wide, and about 10 mm. in antro-posterior diameter. (Dall.)

Type in U. S. N. M., No. 123148. Type locality, Cortez Bank, California coast, in 984 fathoms, U. S. Fisheries Commission Station, 2919.

Range. Kamchatka, Alaska, British Columbia, off Washington coast, and Oregon to San Diego, California. Also Japan.

Family TEREBRATELLIDÆ.

Genus **PLATIDIA** Costa, 1852.

Shell minute, conspicuously punctate; foramen large, encroaching equally on both valves; hinge area small, straight; loop not reflected, attached to a small forked process in the centre of the valve.

Type. Apparently *Orthis anomioides* Philippi.

Distribution. Mediterranean, West Indies, Isle of Bourbon, California, and Lower California.

Range in time. Chalk of Europe; Pleistocene, Signal Hill, Los Angeles County, California.

Platidia seminula radiata Dall, 1885.

Plate 49, figs. 2, 7.

Proc. U. S. N. M., **8**:551.

It differs from the normal type by having fine radiating lines on the upper valve. (Dall.)

TYPE in U. S. N. M. Type locality, San Diego, California.

RANGE. San Pedro, California, to Todos Santos Bay, Lower California. Also off Santa Cruz Island, West Indies, in 218 fathoms.

Genus **TEREBRATULINA** Orbigny, 1847.

Shell finely striated, auriculate, deltidium usually rudimental; foramen incomplete; loop short, rendered annular in the adult by the union of the oral processes. (Woodward Man. Moll.)

TYPE. *Anomia caput-serpentis* Linnæus.

DISTRIBUTION. United States, Norway, Cape, Japan, Scotland, Mediterranean, Ireland, Nova Scotia.

RANGE IN TIME. Oxfordian, United States, Europe.

Terebratulina kiiensis Dall and Pilsbry, 1891.

Plate 16, figs. 13, 14.

Nautilus, **5**:18.

This species differs from the largest *unguicula* with which we have been able to compare it in the following particulars: It is larger and proportionately somewhat wider and the beak proportionately shorter, much such differences as would come about by increased size in such a species as *unguicula*. If more material should prove that the supposed variety cannot be connected with *unguicula*, the varietal name can be taken as specific. Length, 44; length of hæmal valve, 38.5; maximum width, 40; maximum diameter, 21.5 mm. (Dall.)

CO-TYPE in U. S. N. M., No. 128463. Type locality, coast of the Province of Kii, Japan.

RANGE. Unalaska, Alaska, coast of Washington, Santa Cruz, and San Nicolas Island, in deep water. Also Kii, Japan.

Terebratulina unguicula Carpenter, 1865.

Plate 38, figs. 2, 3, 4, 5.

Proc. Zool. Soc., 1865, p. 201; figs. 1–4.

T. t. juniore "Terebratulinæ capiti-serpentis" simillima, sed latiore, subtriangulata; punctis valde conspicuis; costis conspicuis, interdum obtusioribus, aliis intercalantibus; intus amento suboctiformi, postice aperto, cruris diagonalibus cardini affivis: testa adulata va; va inferiore subrotundata, marginem versus haud planata; umbone valde tumente, latiore; striis radiantibus, ut in "T. capiti-serpentis" conspicuous; marginibus

crenulatis, haud undatis; intus amento majore, bisinuato, dorsaliter haud continuo, calcaribus duobus munito. Long., .6; lat., .5; alt., .3 poll. (Carpenter.)

Shell ovate, longer than wide; valves almost equally convex, rounded laterally and in front; lateral sides of the umbo strongly auricular, especially in young and middle-aged specimens. Ventral valve evenly convex, but sometimes very slightly depressed anteriorly; beaks short, obliquely truncated by a rather large, incomplete foramen, margined anteriorly by the umbo of the dorsal valve and by two small lateral deltidia. Surface of valves marked with numerous radiating, delicate riblets, simple and stronger at their origin, but rapidly augmenting in number from bifurcation and by the interpolation of shorter riblets between the longer ones. Valves crossed with concentric raised striæ, loop short and simple, the crura disunited in the young, annelliform in the more advanced age. Colour light yellowish white. (Davidson.)

Type in British Museum? Type locality, Monterey, California.

Range. Unalaska, Kodiak Island, Forrester Island, Alaska; Gulf of Georgia; San Diego, California; Cape San Lucas, Lower California.

Genus **TEREBRATALIA** Beecher, 1893.

Shell transversely ovate, thin, rugose, with a concave impression in the middle; beaks rather short; marginal line somewhat flexuous, slightly sinuated in front; foramen very large, incomplete; deltidia small, widely divided; margin of the valves entire.

Type. *Terebratula transversa* Sowerby.

Distribution. West coast of America, Japan, China, Atlantic coast of America.

Terebratalia transversa Sowerby, 1846.

Plate 16, figs. 1, 2, 3.

Proc. Zool. Soc., 1846, p. 94.

Ter. testa transversim subovata, tenui, rudi, glabra, pallescente; linea marginali subflexuosa, antice subsinuata; foramine maximo, incompleto; area cardinali magna, planata; deltidiis parvis, longe discretis; carina dorsali inconspicua, rotundata; valva ventrali transversim oblonga, antice rotundata, postice in angulo obtusissimo desinente; sulco mediano subinconspicuo, rotundato; margine valvarum integro. (Sowerby.)

Shell very variable in shape, usually quadrispherically transverse, wider than long, broadest posteriorly or near the hinge line, which is very obtusely angular, almost straight, very little shorter than the breadth of the shell; marginal line flexuous and situated in front. Dorsal valve moderately convex, channelled longitudinally along the middle by a concave depression or sinus. Ventral valve much deeper than the dorsal one,

with a longitudinal elevation or fold extending from the beak to the front; beak short, slightly incurved, and truncated by a large incomplete foramen, margined anteriorly by a portion of the umbo of the opposite valve, and laterally by two small deltidial plates; beak ridges strongly defined, leaving between them and the hinge line a flat or gently concave smooth area. Surface of valves either smooth or more or less covered with faint or strong angular ribs, here and there bifurcating, or with a short rib interpolated between the larger ones. Shell structure perforated by minute canals. In the interior of the dorsal valve the hinge plate is divided; cardinal process small, and from under it a mesial septum of small elevation extends to about half the length of the valve. Loop long, doubly attached, first to the base of the hinge plate, then to the anterior extremity of the mesial septum of an oblique lamina given off from about the middle of the length of the principal stems of the loop, when, after having attained their greatest length, they become reflected in the shape of a loop. Colour varying from light ashy yellow to a light or dark livid purple or red mixed with yellow, deeper in colour on the lines of growth. Length, 1 inch, 3 lines; breadth, 1 inch, 7 lines; depth, 10 lines. (Davidson.)

TYPE in British Museum. Type locality, Puget Sound, Washington.

RANGE. Southeast of Alaska Peninsula, Vancouver Island; Puget Sound; Monterey Bay; San Pedro, California.

Terebratalia transversa caurina Gould, 1850.

Plate 16, figs. 4, 5, 6, 7.

Proc. Boston Soc. Nat. Hist., 3:347. *Wilkes Expl. Exped. Shells*, p. 468. *Am. Jour. Conch.*, 6:119; pl. 6, figs. 1–3, 1870.

T. parva, fusco-cinerea, transversa, convexiuscula; quincuncialiter punctata, costis angulatis ad 12 interdum bifurcatis radiata; margine ventrali circulari, flexuoso; apice acuta, rectangulari; lateribus rectilinearibus, incumbentibus; rostro bervi, vix curvato; foramine circulari, interrupto; apophysis branchialis tenuissima, angustata. Long., ½; lat., $^{11}/_{20}$; alt., ⅕ poll. (Gould.)

Shell small, dusky-ash colour, moderately convex, rather broader than long; ventral margin rounded, with a central broad flexure, and corresponding depression in the smaller, and angulation of the larger valve; surface with twelve or more obtusely angular, radiating ribs, gradually enlarging, and sometimes bifurcating; interspaces and elevations about equal; the whole with microscopic opaque dots; small valve having the apex a little pointed, and the posterior outlines otherwise rectilinear, and forming a very obtuse angle; large valve forming about a right angle at beak, but with the lateral outline concave, and the margin incumbent, forming a broad, nearly flat area; beak but little raised, pointed; the ligament aperture very large, circular, a part of its margin formed by the

apex of the small valve; internal apophysis similar to that of *T. pulvinata,* but much more delicate and thread-like, the two branches curving toward each other so as almost to touch. Length, half an inch; breadth, eleven-twentieths of an inch. (Gould.)

TYPE locality, Puget Sound.

RANGE. St. Paul Island, Alaska; Victoria and Queen Charlotte Islands, British Columbia; San Diego, California.

Terebratalia occidentalis Dall, 1871.

Proc. Cal. Acad. Sci., **4**:182; pl. 1, fig. 7.

Shell variable in size and shade of colour, usually of a flesh tint, deeper on some of the lines of growth. Sculptured by radiating ribs variable in number (9 in the typical specimen), with rather smooth interspaces, only crossed by more or less prominent lines of growth. Hinge line long, somewhat arched in the middle; area usually wide, sharply carinated, flat, crossed by transverse lines of growth. Apex not prominent, usually eroded. Foramen large, incomplete, deltidia widely separated and differentiated from the area by deep grooves. Typical specimen, .75 in. long; .6 in. wide; and .2 in. thick. (Dall.)

TYPE in Cabinet of the California Geological Survey, No. 6. Type locality, off San Clemente Island, California.

RANGE. San Pedro, California, to Cortez Bank, in 47 fathoms.

Terebratalia obsoleta Dall, 1891.

Proc. U. S. N. M., **14**:186 and **17**:726; pl. 30, fig. 7.

Shell scarlet, radiately streaked with pale yellow, especially in the channels between the ribs; surface polished, smooth except for rather distinct incremental lines and, in adult specimens, more or less distinct; partially obsolete radial ribs, which appear near the margin, but do not extend to the earlier half of the shell; in senile specimens a larger proportion of the shell is ribbed; pedicle valve with a rather low beak and wide, incomplete foramen; delitidial plates well developed but widely separated; valve wider (as a rule) below the middle, the arch of the base cut into three subequal parts by two especially strong ridges (corresponding to channels on the branchial valve), between which the surface of the valve may be more or less ribbed radially, but is always flattened or depressed, corresponding to an upward flexure of the basal margin; teeth strong, supported by deeply receding buttresses; no medial septum; the adductors with widespread ends, rather distant from the medial line, confined to the upper third of the valve; pallial sinuses large, divaricating near the margin from five principal trunks on each side; the gential glands yellowish, extending in narrow bands along the sinuses nearly to their furcation; peduncle short, dark brown; branchial valve flatter, with a

wide, low, cardinal process, little prominent; teeth strong without buttresses, medial septum short, very thin and high, subtriangular; brachidium unusually slender; pallial sinuses numerous, much branched with a medial trunk nearly reaching the margin. Height of average specimen, 30; width, 30; diameter, 17 mm. (Dall.)

TYPE in U. S. N. M. Type locality, northwest of Cerros Island, Lower California. U. S. Fisheries Commission Station, 2983.

RANGE. Catalina Island to off Point Abrêojos, Lower California.

Genus **LAQUEUS** Dall, 1870.

Shell with the reflected portion of the loop attached by slender processes, on each side, to the hæmal process at or near the points where the two septal processes branch off to the septum. Foramen complete. It will be observed that the reflected part of the loop is attached by the two (lateral) processes, not to the septum nor to the septum processes, but to the hæmal portions of the loop (which I have termed hæmal processes); thus the two septal processes, the two lateral processes, and the "bight" of the neural loop, form a somewhat sinuous ring, intersected by the point of the septum, the hæmal processes and the two sides of the neural loop. (Dall.)

TYPE. *Laqueus californicus* Koch.

DISTRIBUTION. West coast of North America, Japan.

Laqueus californicus Koch, 1847.

Plate 17, figs. 1, 2, 3, 4.

Chemnitz, *Conch. Cab.* ed. 2., p. 38; pl. 2b, figs. 21–23.

Shell large, longitudinally oval, inflated; margins slightly sinuous. Dorsal valve uniformly convex, with occasionally a very slight tendency to depression close to the frontal margin. Ventral valve a little deeper than the dorsal one, with sometimes a slight indication of a mesial, longitudinal elevation or flattened fold; beaks incurved, truncated by a small circular foramen, margined anteriorly by two wide deltidial plates; beak ridges sharply defined, leaving between them and the hinge line a flattened space. Surface of valves smooth, with concentric lines of growth, shell perforations rather large. Colour livid yellowish brown or light reddish brown. Length, 2 inches, 6 lines; breadth, 1 inch, 11 lines; depth, 1 inch. In the interior of the dorsal valve the hinge plate is bifid; cardinal process inconspicuous. The septum, of small elevation, extends from under the middle of the hinge plate to a little more than a third of the length of the shell; the principal laminæ of the loop, after having been attached to the angles of the hinge plate and giving off short curved crura, proceed a short distance, when they again give off two slightly oblique laminæ,

which become attached to the anterior edge of the mesial septum. The principal stems of the loop then extend to within a short distance of the frontal margin, where they become deflected in the shape of a horseshoe, giving off on each side a short lamella near their upper extremity, thus connecting the reflected portion with the principal stems of the loop close to the point where the two oblique lamellæ leave for their attachment to the mesial septum. (Davidson.)

TYPE locality, California.

RANGE. British Columbia to off Point Loma, California.

Laqueus californicus vancouverensis Davidson, 1887.

Plate 17, figs. 5, 6, 7, 8, 9, 10.

Davidson, *Mon. Rec. Brach.* pt. 2 p. 113; pl. 18, figs. 10–13b.

Off Vancouver Island we find in large numbers a smaller race or northern form which Mr. Dall considers to be *Laqueus californicus*. The shell has also been quoted by Mr. J. F. Whiteaves from off Metla-katla, Queen Charlotte Islands, British Columbia, and from between Race Island Lighthouse and Victoria Harbour, 30–70 fathoms, as well as off the N. W. end of Texada Island, in 40–70 fathoms, west coast of North America. I have examined a number of specimens of this shell, some quite circular, others ovate and truncate anteriorly with a slight depression on the anterior third of the length of both valves. The foramen is also comparatively larger than in typical Californian examples of *Laqueus californicus*. Interiorly the loop and its attachments are similar to those of the Californian shell. It is decidedly of a livid yellowish-brown colour. After consulting with Mr. Dall upon the subject, he wrote me back, on the 17th of December, 1884: "The shells from Vancouver which I referred to *L. Californicus* are, I am quite confident, a northern form of that species, less brightly coloured, thicker and ruddier. I have northern specimens fully as large as the southern ones, and I believe my *Megerlia Jeffreysi* to be the young stage of it. The northern form might perhaps have a varietal name, but if we had plenty of specimens, I think they would be found to intergrade." (Davidson.)

TYPE locality, off Vancouver Island, British Columbia.

RANGE. Southeast Alaska, Kodiak Island, Juneau Harbor, Forrester Island; off British Columbia; Juan de Fuca Strait, Puget Sound, Washington coast.

Laqueus erythræus Dall, 1920.

Suppl. Rep. Brit. Assoc., pp. 568, 574, 1864. *Amer. Jour. Conch.* 6:123–4.

Shell oval, thin, inflated, pale at the umbos, elsewhere of a light reddish brown, darker toward the margin; perforations large, oval, crowded, arranged in quincunx order externally; minute, circular, very close to-

gether, internally. Margin straight, without perceptible curve or sinuation; slightly angular at the anterior edge, giving a very slight appearance of truncation. Valves nearly equally inflated. Beak of the neural valve small, recurved, obliquely truncated. Foramen small, entire, apical; the carination of the edge of the false area encroaches on the perforation in a triangular point on each side. False area small, narrow, smooth, roundly carinated at the edge. Deltidia very short and wide, united. Long., 1.9 inch; lat., 1.6 inch; diameter, 1.2 inch; height of neural apex above the opposite umbo, .15 of an inch; diameter of foramen, 1 inch. Peduncle very short and stout. Teeth of the neural valve short and stout. Hinge line very slightly emarginate (for the cardinal process) beneath the umbo, otherwise gently rounded. Teeth supported by shelly plates beneath the hinge line. Cavity of the apex infundibulate. Out of this cavity proceed two strong, but not prominent, ridges, which radiate toward angles of the anterior edge of the margin, but become evanescent before passing the central third of the shell. Between these ridges are two others, one on each side, close to the median line, shorter and less prominent than the first. There are faint indications of others outside the two first mentioned, and these ridges, except the first two, are variable in different individuals. Cardinal process very conspicuous. Cardinal plate broadly pentagonal, centrally depressed. Septum not prominent, diminishing in height from the edge of the plate forward, and not extending more than half the length of the shell; point of attachment of the apophyses quite close to the plate. Apophyses start from the anterior angles of the plate and give off two curved slender crura; the hæmal processes are very slender; septal processes still more so; reflected portion quite broad, somewhat angulated behind, the inner edge of the hæmal processes at the point from which the septal processes are extended to the septum. There is no flat top to the latter, such as is seen in *Ter. dorsata, effusa et caurina.* (Dall.)

Type in N. S. N. M., No. 19395. Type locality, off Catalina Island, in 80 fathoms.

Range. Known only from the type locality.

Genus **MARCIA** H. & A. Adams, 1857.

Shell with the surface of the valves smooth. (H. & A. Adams.)

Shell large, subquadrate, concentrically lamellose and striated, without radial sculpture, and a dull, earthy surface; internal margin smooth; pallial sinus small, angular, free; hinge with three left and four right cardinals, the middle ones larger and grooved above. (Dall.)

Distribution. Alaska to California.

Tertiary. North America.

Type. *Venus exalbida* Dillwyn.

Subgenus Mania Gray, 1849.

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INDEX

	Page
abyssicola (Lyonsiella)	97
Acar	45
Acharax	9
Acila	14
acuta (Leda)	16
adamsianus (Mytilus)	66
Adula	71
æquisulcatus (Pecten)	58
æquizonatus (Phacoides)	127
affinis (Tagelus)	187
africana (Dosinia)	147
agassizii (Solemya)	9
Agriodesma	93
akutanica (Limopsis)	43
ala-papiliones (Paphia)	156
alaskana (Lyonsiella)	97
alaskana (Macoma)	177
alaskana (Spisula)	193
alaskensis (Astarte)	106
alaskensis (Pecten)	62
albida (Glottidia)	221
albidus (Pecten)	52
aleutica (Diplodonta)	124
aleutica (Rochefortia)	133
Aligena	132
Allogramma	92
alta (Metis)	169
alta (Siliqua)	190
amabilis (Lyonsia)	92
amblia (Leda)	21
Amiantis	150
amiata (Leda)	17
ampla (Panomya)	207
Anatina	190
anatina (Mactra)	191
anatinoides (Poromya)	94
andersoni (Pecten)	61
Angulus	166
Anisodonta	140
annulatus (Phacoides)	126
Anomia	64
Anomidæ	64
anomioides (Orthis)	225
Antigona	151
apodema (Cuspidaria)	98
approximatus (Phacoides)	128
arata (Tindaria)	38
Arca	44
Archivesica	148
Arcidæ	41
Arcopagia	165
arctica (Astarte)	106
arctica (Leda)	26
arctica (Saxicava)	208
arenaria (Mya)	198
arenosa (Lyonsia)	92
argenteria (Periploma) Plate	22
aristata (Lithophaga)	73
arnheimi (Macoma)	172
Astarte	104
Astartidæ	104
Asthenothærus	86
atlantica (Callocardia)	147
Atrina	46
attenuata (Lima)	64
attenuata (Lithophaga)	73
australis (Rochefortia)	132
Axinopsis	122
Axinulus	122
bakeri (Bernardina)	108
bakeri (Erycina)	129
balboæ (Cuspidaria)	100
balliana (Erycina)	130
balthica (Macoma)	172

	Page
Bankia	216
barbarensis (Thyasira)	120
barbarensis (Venericardia)	111
Barbatia	45
Barnea	209
Bathyarca	46
beachi (Teredo)	218
beckii (Liocyma)	158
bennettii (Astarte)	107
beringiana (Panomya)	207
beringiana (Poromya)	95
beringiana (Yoldia)	28
beringensis (Cuspidaria)	100
beringi (Thracia)	85
beringensis (Rochefortia)	133
beringianus (Pecten)	55
Bernardina	108
biangulatum (Cardium)	144
Bibliography	233
bifurcatus (Septifer)	67
bilirata (Pandora)	89
bimaculata (Heterodonax)	186
binghami (Sphænia)	199
binominatus (Pecten)	61
bipalmulata (Teredo)	216
bistriatus (Pecten)	60
bisecta (Thyasira)	120
bodegensis (Tellina)	168
borealis (Astarte)	106
Bornia	137
Botula	70
Brachiopoda	221
Brachydontes	70
branneri (Crassinella)	110
brevis (Saxidomus)	153
brota (Macoma)	170
brunnea (Psephidia)	162
brunnea (Tindaria)	38
buccata (Leda)	25
buddiana (Chama)	119
bulla (Lyonsia)	96
buttoni (Poromya)	95
buttoni (Tellina)	167
calcarea (Macoma)	173
californianus (Mytilus)	66
californianus (Tagelus)	186
californica (Cryptomya)	199
californica (Cuspidaria)	101
californica (Donax)	183
californica (Ervilia)	197
californica (Grippina)	205
californica (Lyonsia)	91
californica (Mactra)	192
californica (Parapholas)	210
californica (Psammobia)	185
californica (Sportella)	139
californica (Tindaria)	38
californica (Xylophaga)	215
californicus (Laqueus)	230
californicus (Phacoides)	127
californiense (Cardium)	143
californiensis (Botula)	71
Callithaca	156
Callocardia	148
callosa (Amiantis)	151
callosa (Cythera)	150
Callucina	127
calyculata (Chama)	110
Calyptogena	116
cancellata (Venus)	153
cancellatus (Platyodon)	202
candida (Pholas)	209
capax (Modiolus)	69
capax (Schizothærus)	196
capsa (Yoldia)	34
cardara (Nucula)	12
Cardiidæ	141
cardiiformis (Verticordia)	103
Cardiomya	99
Cardita	110
Carditamera	110
Carditidæ	110

	Page
carditoides (Petricola)	163
Cardium	141
carlottensis (Macoma)	175
carlottensis (Nucula)	13
carpenteri (Tellina)	166
castrensis (Nucula)	14
catalinæ (Erycina)	129
catilliformis (Spisula)	194
caurina (Terebratalia)	228
caurinus (Pecten)	57
cecinella (Yoldia)	34
centifilosa (Protocardia)	146
Cerastoderma	142
cerittensis (Aligena)	132
cervola (Tindaria)	40
Cetoconcha	96
chacei (Erycina)	130
challisiana (Thracia)	84
Chama	118
Chamidæ	118
chemnitzianum (Pedalion)	49
chilensis (Cuspidaria)	99
chilensis (Malletia)	36
Chione	153
Chlamydoconcha	140
Chlamydonchidæ	140
Chlamys	52
ciliatum (Cardium)	142
cinnamomeus (Mytilus)	70
circularis (Pecten)	58
Cnesterium	31
columbiana (Crenella)	80
collinsoni (Leda)	26
compacta (Astarte)	104
complanatum (Anisodonta)	140
compressa (Pseudopythina)	136
compressa (Rochefortia)	134
concamerata (Pholadidea)	211
conceptionis (Leda)	21
conradi (Donax)	184
conradiana (Transennella)	150
Cooperella	163
Cooperellidæ	163
cooperi (Yoldia)	30
corbis (Cardium)	142
Corbula	202
Corbulidæ	202
corbuloides (Erycina)	137
corbuloides (Thracia)	84
coronata (Erycina)	129
corpulenta (Arca)	46
corrugata (Modiolaria)	77
cortezi (Hinnites)	63
corteziana (Glycymeris)	42
costatum (Cardium)	141
Crassatellites	109
Crassatellitidæ	109
crassatelloides (Tivela)	150
crassidens (Venericardia)	113
Crassinella	109
crebricostata (Venericardia)	114
Crenella	79
crispata (Pholas)	210
Cryptomya	199
Cumingia	182
curta (Thracia)	84
curtulosa (Leda)	20
Cuspidaria	97
Cuspidariidæ	97
cuspidata (Tellina)	97
Cyathodonta	85
Cyclocardia	111
cygnus (Thyasira)	121
cymata (Psephidia)	161
Cyrilla	36
Cyrtodaria	208
Dacrydium	72
dalli (Leda)	24
darella (Nucula)	14
darwinii (Pholadidea)	213
davidsoni (Pecten)	61
decipiens (Pododesmus)	65

	Page
decisa (Semele)	179
declivis (Tellina)	165
decussata (Crenella)	79
dehiscens (Lima)	63
demissus (Modiolus)	70
denticulata (Petricola)	163
Dermatomya	95
Diberus	73
dicofania (Tindaria)	39
diegensis (Botula)	71
diegensis (Limopsis)	43
diegensis (Pecten)	51
diegensis (Thracia)	85
Diplodonta	123
Diplodontidæ	123
Discinisca	222
discors (Mytilus)	74
discus (Periploma)	82
divaricata (Crenella)	81
Divaricella	128
dolabriformis (Mactra)	191
Donacidæ	183
Donax	183
dorsalis (Xylophaga)	215
dubia (Psammotea)	139
dubiosa (Cyathodonta)	86
edentula (Psammobia)	185
edentula (Tellina)	171
edentula (Venus)	125
edentuloides (Lucina)	125
edulis (Mytilus)	66
elatum (Cardium)	144
elongata (Calyptogena)	116
Empleconia	44
ensifera (Yoldia)	32
Ensis	188
Entodesma	93
ephippium (Anomia)	65
Epilucina	127
Ervilia	196
Erycina	129
erythræus (Laqueus)	231
esquimalti (Astarte)	108
eudoxium (Cardium)	144
eutænia (Pandora)	89
exalbida (Venus)	232
excavata (Thyasira)	121
exigua (Nucula)	13
exogyra (Chama)	119
expansa (Macoma)	176
expansa (Nucula)	14
expansa (Ostrea)	50
extenuata (Leda)	22
faba (Malletia)	37
fabula (Astarte)	107
falcata (Botula)	71
falcata (Spisula)	195
Felaniella	125
ferrœnsis (Tellina)	184
ferruginosa (Rochefortia)	133
ferruginosas (Thyasira)	122
fiascona (Leda)	23
filosa (Pandora)	88
fiora (Malletia)	37
flabellatus (Modiolus)	68
flavescens (Semele)	182
fluctifraga (Chione)	153
fluctuatus (Crassatellites)	109
fluctuosa (Venus)	158
fordi (Antigona)	152
formosa (Lyonsia)	93
fornicatus (Modiolus)	69
forresterensis (Pandora)	90
fossa (Leda)	19
Fossularca	45
fragilis (Corbula)	203
fragilis (Sphenia)	200
Fragum	144
Frielia	224
frondosa (Chama)	118
fucanum (Cardium)	143
fucicolus (Pecten)	58

	Page
Gemma	160
gemma (Gemma)	160
generosa (Panope)	205
gibbsii (Tindaria)	40
gibbus (Solen)	186
giganteus (Hinnites)	63
giganteus (Saxidomus)	153
gigas (Vesicomya)	148
glacialis (Cuspidaria)	98
glacialis (Leda)	26
glacialis (Pandora)	89
globosa (Astarte)	108
globula (Sphenia)	201
Glottidea	221
Glycymeris	41
glycymeris (Mya)	205
Gobræus	184
golischi (Rochefortia)	135
gomphoidea (Leda)	22
gouldii (Donax)	183
gouldii (Lyonsia)	92
gouldii (Thyasira)	120
gouldii (Venericardia)	112
grandis (Pandora)	87
granulata (Pandora)	89
grebnitzskii (Rochefortia)	133
Gregariella	70
grippi (Rochefortia)	134
Grippina	204
grisea (Crenella)	80
groenlandicus (Serripes)	145
Halistrepta	83
halli (Frielia)	224
hamata (Leda)	23
haroldi (Lyonsia)	91
hastatus (Pecten)	53
Hemimactra	193
Hemithyris	222
hemphilli (Spisula)	194
Here	126
hericius (Pecten)	52
Heteroclidus	90
Heterodonax	186
hillanum (Cardium)	146
hindsii (Pecten)	53
Hinnites	63
Hormomya	67
hirundo (Mytilus)	47
hyalinum (Osteodesma)	92
idæ (Tellina)	164
imbricata (Venericardia)	111
impressa (Modiolaria)	75
inæquivalvis (Periploma)	82
incisa (Venericardia)	115
incongrua (Macoma)	170
incongrua (Semele)	181
incongruus (Pecten)	61
indentata (Macoma)	178
inflata (Lyonsia)	93
inflatula (Macoma)	174
inquinata (Macoma)	172
intercalata (Martesia)	214
intermedia (Mya)	199
intermedia (Yoldia)	35
irus (Venus)	160
islandicus (Pecten)	54
johnsoni (Solemya)	9
jordani (Pecten)	55
Kellia	131
kelseyi (Corbula)	204
kelseyi (Macoma)	171
kelseyi (Milneria)	117
Kennerlia	87
kennerlyi (Marcia)	155
kennerlyi (Tindaria)	41
kennicottii (Venus)	155
kiiensis (Terebratulina)	226
kincaidi (Pecten)	53
kurriana (Cyrtodaria)	208
Labiosa (Anatina)	190
Labis	73
laciniata (Paphia)	157

	Page
Lævicardium	144
lævigata (Modiolaria)	77
lamellaris (Antigona)	152
lamellata (Tellina)	165
lamellifera (Venerupis)	160
lamellosa (Cumingia)	182
laperousii (Kellia)	131
laperousii (Serripes)	145
lapicida (Venus)	162
Laqueus	230
Lasæa	137
latiauritus (Pecten)	57
lazara (Chama)	118
leana (Crenella)	80
Leda	15
Ledidæ	15
Leiomya	102
leonina (Leda)	21
leonina (Poromya)	96
lepta (Vesicomya)	147
Lepton	137
Leptonidæ	129
leptonoidea (Macoma)	175
Leptopecten	57
Lima	63
lima (Ostrea)	63
limata (Leda)	24
Limatula	64
limatula (Yoldia)	31
Limidæ	63
Limopsis	43
Lingulidæ	221
linki (Nucula)	12
Liocyma	158
liogona (Leda)	18
liotricha (Macoma)	176
Lithophaga	72
lithophagus (Mytilus)	72
lomænsis (Leda)	15
lordi (Psephidia)	161
loscombiana (Pholididea)	211
loxia (Astarte)	106
lucida (Siliqua)	189
Lucina	125
Lucinidæ	125
Lucinisca	126
Lucinoma	126
lupinus (Venus)	123
lurida (Ostrea)	50
lutea (Tellina)	169
luteola (Corbula)	203
Lyonsia	90
Lyonsiella	97
Lyonsiellidæ	97
Lyonsiidæ	90
Lyorodus	219
mac'andrewi (Kellia)	136
Macoma	170
Macrodactyla	9
macroschisma (Pododesma)	65
Mactra	191
Mactridæ	190
mactroides (Venus)	149
Mactromeris	193
Mactrotoma	191
magus (Solen)	188
malespinæ (Cetoconcha)	96
Malletia	36
Mantellum	63
Marcia	232
marmorata (Modiolaria)	77
Martesia	213
martiniana (Tindaria)	39
martyria (Yoldia)	29
media (Siliqua)	189
melanura (Pholadidea)	212
mercenaria (Venus)	154
meridionalis (Venericardia)	115
Merisca	165
mercœum (Lepton)	137
meropsis (Tellina)	166
Mesodesmatidæ	196

	Page
Mesopleura	187
Metis	169
mexicana (Tindaria)	40
mexicana (Xylophaga)	215
meyeri (Tellina)	169
middendorffii (Macoma)	170
migueliana (Glycymeris)	42
Milneria	117
minima (Milneria)	117
minuta (Ceropsis)	117
minuta (Leda)	15
minuta (Venus)	138
Miodontiscus	115
modesta (Tellina)	167
Modiolaria	74
Modiolus	67
modiolus (Modiolus)	68
Mœrella	165
mœsta (Macoma)	173
Monia	65
monilicosta (Venericardia)	114
monotimeris (Pecten)	57
montereyensis (Yoldia)	28
multicostata (Arca)	45
munitum (Pleurodon)	36
mutica (Cumingia)	182
Mya	197
Myacidæ	197
myaciformis (Pseudopythina)	136
myalis (Yoldia)	30
Myoforceps	73
Myonera	102
Mytilidæ	65
Mytilimeria	94
Mytilus	65
nana (Cuspidaria)	99
nasuta (Macoma)	174
nasuta (Mactra)	192
navalis (Teredo)	214
navarchus (Pecten)	54
Navea	214
navisa (Leda)	17
nestiotes (Lyonsia)	91
Nettastomella	213
newcombiana (Pteria)	151
nigra (Modiolaria)	74
nitens (Mya)	197
nitida (Lyonsia)	92
nitidum (Osteodesma)	92
noæ (Arca)	44
nodulosa (Venericardia)	113
norrisi (Malletia)	36
nucleator (Arca)	46
Nucula	11
Nuculidæ	11
norvegica (Lyonsia)	92
norvegica (Mya)	206
nuttallii (Mytilimeria)	94
nuttallii (Phacoides)	126
nuttallii (Sanguinolaria)	185
nuttallii (Saxidomus)	152
nuttallii (Schizothærus)	196
obesa (Corbula)	202
obesa (Modiolaria)	74
obesus (Donax)	183
obliqua (Nucula)	11
oblonga (Phistiphora)	135
obsoleta (Terebratalia)	229
occidentalis (Terebratalia)	229
occidentalis (Turtonia)	139
oleacina (Yoldia)	33
oldroydi (Atrina)	47
oldroydi (Cuspidaria)	101
olivacea (Modiolaria)	75
oneilli (Macoma)	173
opifex (Modiolus)	70
orbella (Diplodonta)	124
orbella (Paphia)	157
orbiculatus (Axinopsis)	123
orcia (Yoldia)	33
orcutti (Chlamydoconcha)	141
ornata (Lucina)	128

	Page
ornata (Verticordia)	103
Ostrea	50
Ostreidæ	50
Oudardia	167
ovalis (Psephidea)	161
ovalis (Vesicomya)	148
ovoidea (Pholadidea)	212
ovoidea (Sphenia)	200
oxia (Leda)	18
Pachydesma	149
pacifica (Barnea)	209
pacifica (Calyptogena)	116
pacifica (Malletia)	37
pacifica (Saxicavella)	207
pacifica (Semele)	180
pacificum (Dacrydium)	72
pallidulus (Modiolus)	69
palmeri (Glottidia)	221
palmula (Ostrea)	51
panamensis (Solemya)	10
panamensis (Tellina)	167
Pandora	87
Pandoridæ	87
Panomya	206
Panope	205
Paphia	156
Parapholas	210
parva (Pholadidea)	213
Parvilucina	128
Patinopecten	57
patula (Siliqua)	190
paucicostata (Venericardia)	112
paucicostatus (Pecten)	56
paucistriata (Neæra)	102
Pecten	51
Pectenidæ	51
pectinata (Cuspidaria)	101
pectinata (Tellina)	125
Pedalion	48
pedroana (Cyathodonta)	86
pedroana (Rochefortia)	134
penderi (Leda)	17
penita (Pholadidea)	211
pellucida (Anisodonta?)	140
pellucida (Chama)	118
Periploma	81
Periplomatidæ	81
pernula (Leda)	19
Peronidea	168
perparvula (Divaricella)	128
peruviana (Anomia)	65
petittii (Paphia)	157
Petrasma	10
Petricola	162
Petricolidæ	162
petriola (Nucula)	12
Phacoides	125
phenax (Modiolaria)	78
phenaxia (Leda)	23
Philobrya	49
Philobryidæ	49
Pholadidæ	209
Pholadidea	211
pholadidea (Sphenia)	201
pholadis (Saxicava)	209
Pinnidæ	46
Pitaria	151
Plagioctenium	58
planetica (Cuspidaria)	99
planiuscula (Periploma)	82
planta (Rochefortia)	132
planulata (Spisula)	195
Platidia	225
Platyodon	202
Plectodon	103
plena (Yoldia)	33
Pleurodon	35
plicata (Mya)	207
plumula (Lithophaga)	73
Pododesmus	65
polaris (Astarte)	104
politus (Modiolus)	69

	Page
polygona (Thyasira)	121
pompholyx (Arca)	46
ponderosa (Dosinia)	149
pontonia (Leda)	20
porcella (Corbula)	204
Poromya	94
Poromyacidæ	94
Portlandia	26
prolongata (Venericardia)	115
Propeamusium	62
Protocardia	146
Protothaca	156
protracta (Modiolaria)	75
Psammobia	184
Psammobiidæ	184
Psephidea	160
Pseudamusium	59
Pseudopythina	135
pseustes (Cuspidaria)	99
psittacea (Anomia)	222
psittacea (Hemithyris)	223
Pteria	47
Pteriidæ	47
pugetensis (Lyonsia)	91
pugetensis (Pecten)	55
pulchra (Semele)	181
punctata (Pandora)	90
quadragenarium (Cardium)	141
quadrana (Macoma)	175
quirica (Nucula)	11
radiata (Leda)	25
radiata (Platidia)	226
radiatus (Solen)	189
randolphi (Pecten)	59
rectus (Modiolus)	68
regularis (Psammobia)	184
reticulata (Arca)	45
reticulata (Tellina)	179
retifer (Bornia)	137
Rexithærus	178
Rhynchonellidæ	222
richardsonii (Protocardia)	146
richthofeni (Phacoides)	126
Rictocyma	108
ritteri (Tindaria)	39
Rochefortia	132
rollandi (Astarte)	105
rosaceus (Solen)	188
rosea (Corbula)	203
rostrata (Arca)	15
rostrata (Pholadidea)	213
rotundata (Crenella)	81
rubra (Lasæa)	138
rubropicta (Semele)	180
rubrum (Cardium)	138
ruderata (Paphia)	157
rugifera (Pseudopythina)	136
rugosus (Mytilus)	208
sagitta (Pholadidea)	212
salmonea (Psephidia)	162
salmonea (Tellina)	165
sanesia (Yoldia)	34
Sanguinolaria	185
sanguinolentus (Solen)	185
santarosæ (Erycina)	130
santarosæ (Tellina)	168
Saxicava	208
Saxicavella	207
Saxicavidæ	205
saxicola (Lyonsia)	93
Saxidomus	152
scabra (Leiomya)	103
scammoni (Liocyma)	159
scammoni (Lyonsia)	93
Scapharca	45
Schizothærus	195
scissurata (Yoldia)	31
sculpta (Leda)	19
secta (Macoma)	178
secunda (Yoldia)	28
Semele	179
Semelidæ	179

	Page
seminuda (Modiolaria)	78
seminuda (Yoldia)	31
seminula (Platidia)	226
septentrionalis (Glycymeris)	41
Septifer	67
serricata (Diplodonta)	125
serricatus (Axinopsis)	123
Serridens	135
Serripes	145
setacea (Bankia)	216
setosa (Philobrya)	49
sicarius (Solen)	188
Siliqua	189
siliqua (Yoldia)	35
sinuata (Crassatellites)	109
skenea (Limopsis)	43
Solemya	9
Solemyacidæ	9
Solen	187
Solenidæ	187
solida (Arca)	45
solida (Mactra)	193
solida (Panope)	206
spargana (Leda)	22
spatiosa (Paphia)	158
Sphenia	199
Spisula	192
Sportella	139
squamosus (Solen)	137
staminea (Paphia)	156
stearnsii (Venericardia)	112
stearnsii (Vesicomya)	148
sterna (Pteria)	48
striata (Cuspidaria) Plate	54
striata (Lyonsia)	92
striata (Pholas)	214
strigata (Discinisca)	222
stultorum (Mactra)	191
stultorum (Tivela)	149
subauriculata (Lima)	64
subdiaphana (Cooperella)	163
subdiaphana (Œdalina)	163
subglacialis (Cuspidaria)	98
subglobosa (Navea)	214
subobsoleta (Glycymeris)	42
suborbicularis (Kellia)	131
suborbicularis (Mya)	131
subquadrata (Cardita)	110
subquadrata (Diplodonta)	124
substriata (Modolaria)	76
substriatum (Cardium)	145
subteres (Tagelus)	187
succincta (Chione)	154
sulcata (Periploma)	83
sulcatus (Corbula)	202
sulcatus (Pectunculus)	104
Symmorphomactra	195
Tagelus	186
talama (Malletia)	36
tantilla (Transennella)	150
taphria (Leda)	16
taylori (Modiolaria)	76
tillamookensis (Myonera)	102
tillamookensis (Pecten)	59
Tellina	163
Tellinidæ	163
tenera (Macoma)	170
tenerrima (Paphia)	156
tenuiconcha (Poromya)	95
tenuis (Nucula)	13
tenuirostris (Macoma)	178
tenuisculptus (Phacoides)	128
Terebratalia	227
Terebratulina	226
Teredidæ	216
Teredo	217
Teredops	219
Theora	103
Thracia	83
Thraciidæ	83
thraciæformis (Yoldia)	27
Thyasira	119

	Page
Thyasiridæ	119
Tindaria	38
Tivela	149
togata (Solemya)	9
townsendi (Teredo)	219
Transennella	150
transversa (Arca) Plate	37
transversa (Terebratalia)	227
trapezoides (Thracia)	84
Tresus	195
tricarinata (Thyasira)	122
Tridonta	105
Trigonicardia	144
trisinuata (Thyasira)	121
truncaria (Macoma)	177
truncata (Mya)	197
truncula (Sphenia)	201
trunculus (Donax)	183
tumens (Venus)	151
tumida (Rochefortia)	132
turgida (Panomya)	206
Turtonia	138
undatella (Chione)	154
undulata (Cyathodonta)	85
undulata (Labiosa)	191
ungulicula (Terbratulina)	226
vagina (Solen)	187
vaginata (Leda)	20
vaginatus (Limopsis)	44
valvulua (Solemya)	11
vancouverensis (Pecten)	60
vancouverensis (Yoldia)	29
Venerella	155
Venericardia	111
Veneridæ	149
Venerupis	159
Ventricola	152
ventricosa (Venericardia)	114
venulosa (Tellina)	169
Venus	154
venusta (Vesicomya)	148
vernicosa (Astarte)	107
vernicosa (Modiolaria)	78
Verticordia	103
Vesicomya	147
Vesicomyacidæ	147
villosior (Asthenothærus)	86
viridis (Axinopsis)	123
viridis (Liocyma)	159
virgata (Tellina)	164
viridozona (Pteria)	48
vitrea (Dacrydium)	72
voyi (Spisula)	193
washingtonia (Xylophaga)	216
willetti (Astarte)	105
Xylophaga	215
xylophaga (Martesia)	214
Yoldia	27
Yoldiella	33
yoldiæformis (Macoma)	177
Zirfæa	210

PLATES
and
EXPLANATION OF PLATES

Plate 1.

Page

Figure 1. *Yoldia cooperi* Gabb 30
Left valve, Santa Cruz, California.

2. *Macoma inflatula* Dall 174
Right valve, British Columbia.
Bull. 2, Nat. Hist. Soc., British Columbia.

3. *Liocyma viridis* Dall 159
Right valve, Kyaska Harbor, Alaska.

4. *Leda pontonia* Dall 20
Stations 2807 and 2808, U. S. N. M., off Galápagos Islands.
Proc. U. S. N. M. 12:257.

5. *Leda pontonia* Dall 20
Same as above.

6. *Tindaria kennerlyi* Dall 41
Off Washington coast.
Bull. 2, Nat. Hist. Soc., British Columbia.

7. *Yoldia intermedia* Sars 35
Vadso. type figure.
Moll. Regionis Arcticæ Norvegiæ.

8. *Macoma inflatula* Dall 174
Same as No. 2.

9. *Tellina lutea* Gray 169
St. Paul Island, Alaska.

10. *Yoldia intermedia* Sars 35
Same as No. 7.

11. *Tellina lutea venulosa* Schrenck 169
Icy Cape, Arctic.

Note—All figures by Crandall are full size and in the Stanford collection, unless otherwise stated.

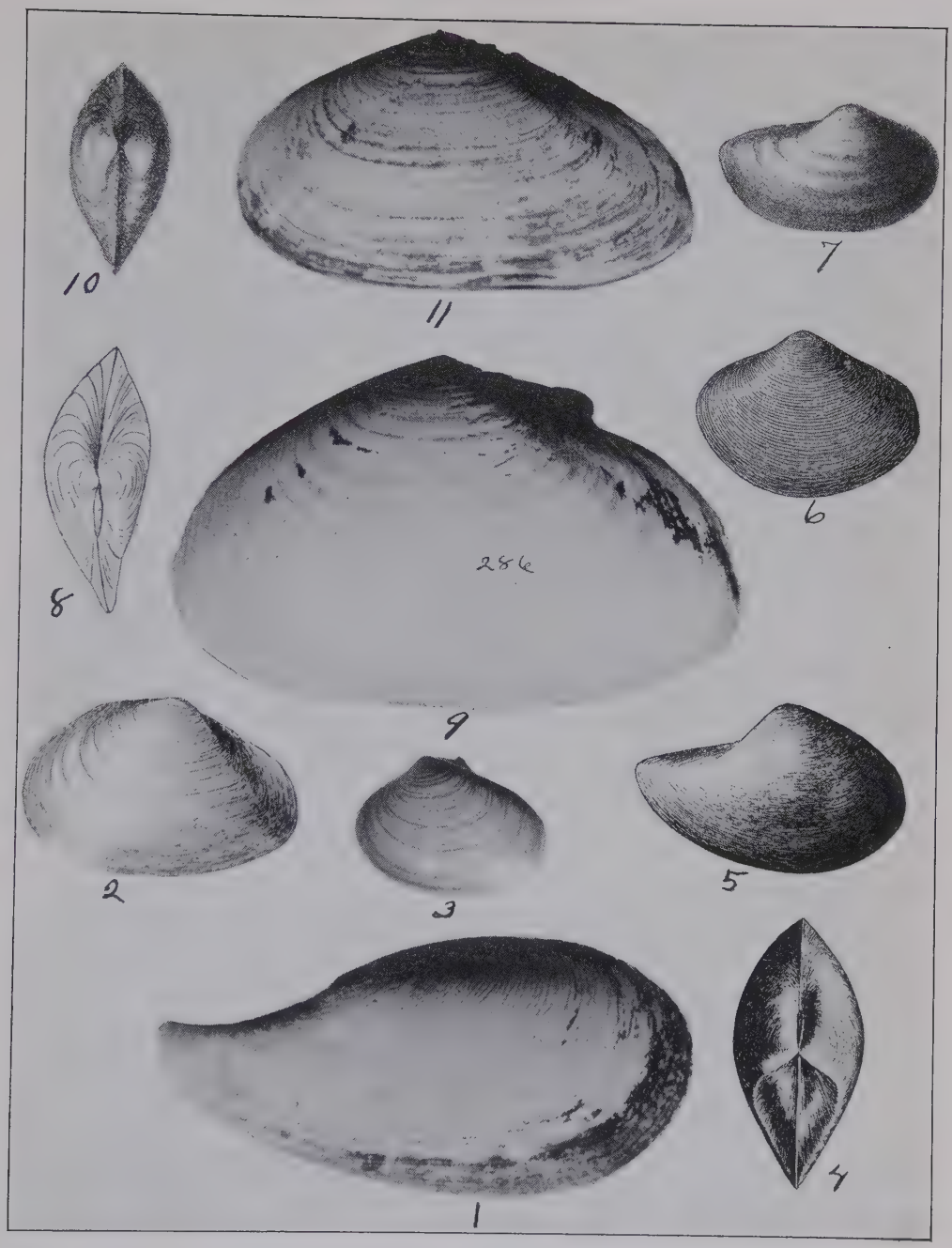


PLATE 1.

Plate 2.

Page

Figure 1. *Panope generosa* Gould 205

2. *Panope generosa* showing hinge 205

Gould's type figures, Puget Sound.
U. S. Expl. Exp., Atlas.

3. *Cardium californiense* Deshayes 143

Bull. U. S. N. M. 112.

4. *Astarte compacta* Carpenter 104

Puget Sound, Proc. U. S. N. M. 26.

5. *Venericardia prolongata* Carpenter 115

Proc. U. S. N. M. 13. Enlarged 5 times. Interior.

6. *Venericardia prolongata* Carpenter 115

Proc. U. S. N. M. 13. Enlarged 5 times. Exterior.

7. *Protocardia centifilosa richardsoni* Whiteaves 146

Bull. U. S. N. M. 112.

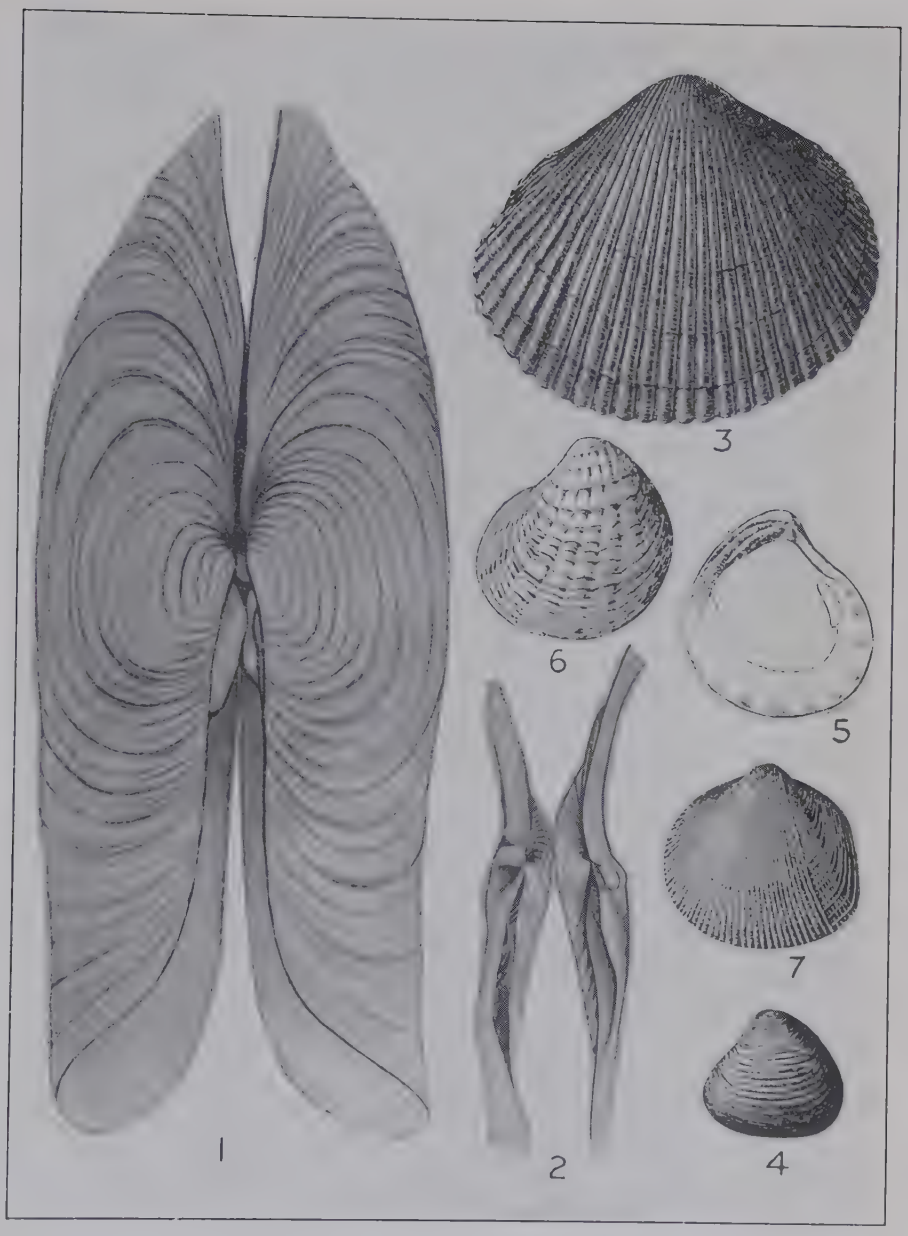


PLATE 2.

PLATE 3.

		Page
FIGURE 1.	*Crenella grisea* Dall. Attu Island, Alaska.	80
2.	*Modiolaria protracta* Dall. Nunivak Island, Bering Sea.	75
3.	*Tindaria californica* Dall. Off Santa Barbara Islands.	38
4.	*Tindaria brunnea* Dall. Bering Sea.	38
5.	*Semele pacifica* Dall. Not given.	180
6.	*Macoma quadrana* Dall. Boca de Quadra, Alaska.	175
7.	*Glycymeris corteziana* Dall. Cortez Bank.	42
8.	*Leda amblia* Dall. Monterey Bay.	21
9.	*Corbula kelseyi* Dall.	204
10.	*Thyasira cygnus* Dall. Cygnet Inlet, Alaska.	121
11.	*Panope generosa solida* Dall. Head of Gulf of California.	206

NOTE—Photograph by U. S. N. M. from type specimens in U. S. N. M.

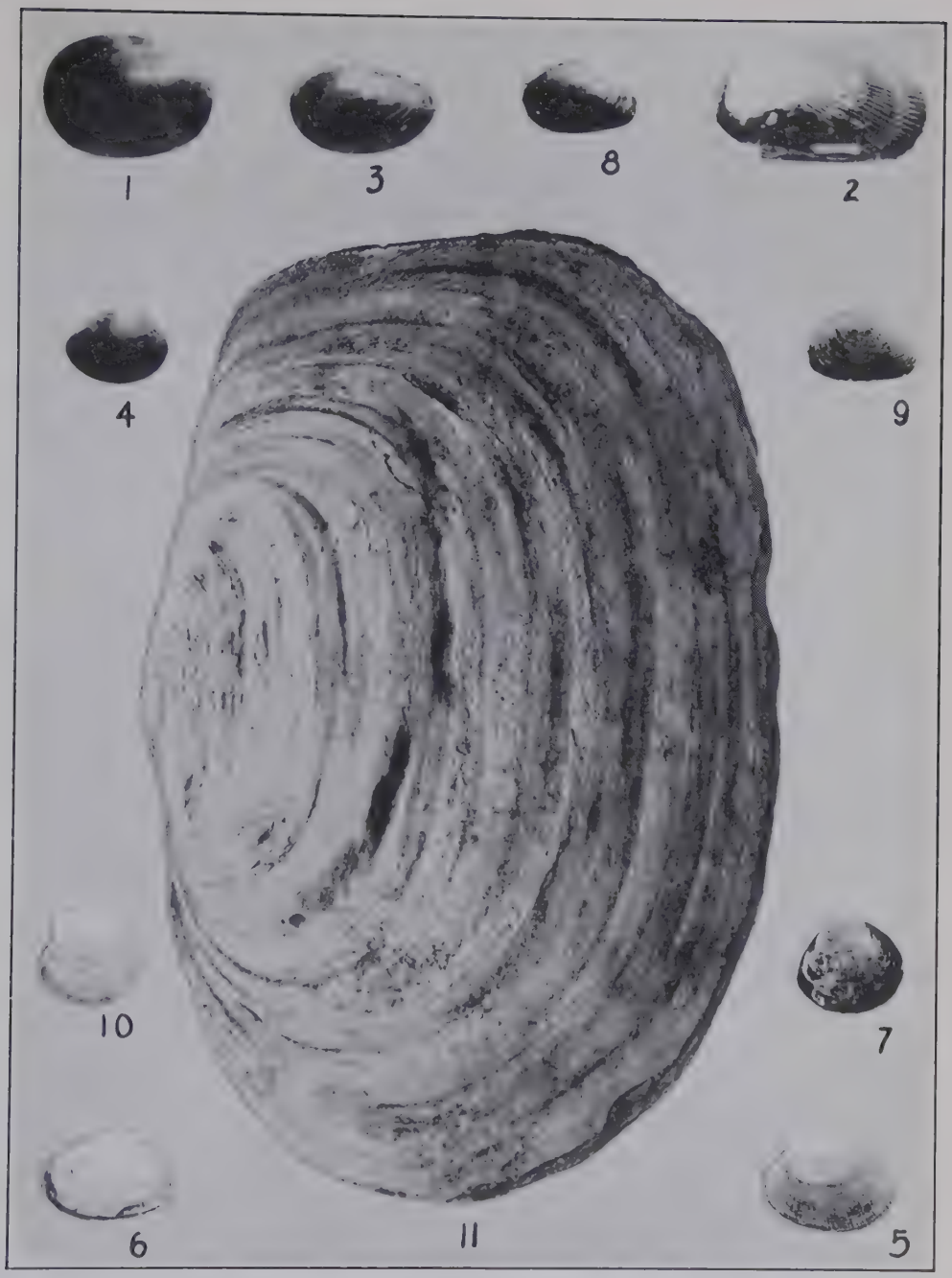


PLATE 3.

PLATE 4.

PAGE

FIGURE 1. *Pecten caurinus* Gould 57
Exterior of right valve a little more than half.
Puget Sound.

2. *Pecten hindsii navarchus* Dall 54
Exterior of right valve.
Arnold Tert. Pectens.

3. *Pecten hindsii navarchus* Dall 54
Exterior of left valve.
Arnold Tert. Pectens.

4. *Axinopsis sericatus* Carpenter 123
Proc. U. S. N. M. 23, from Carpenter's type specimen.

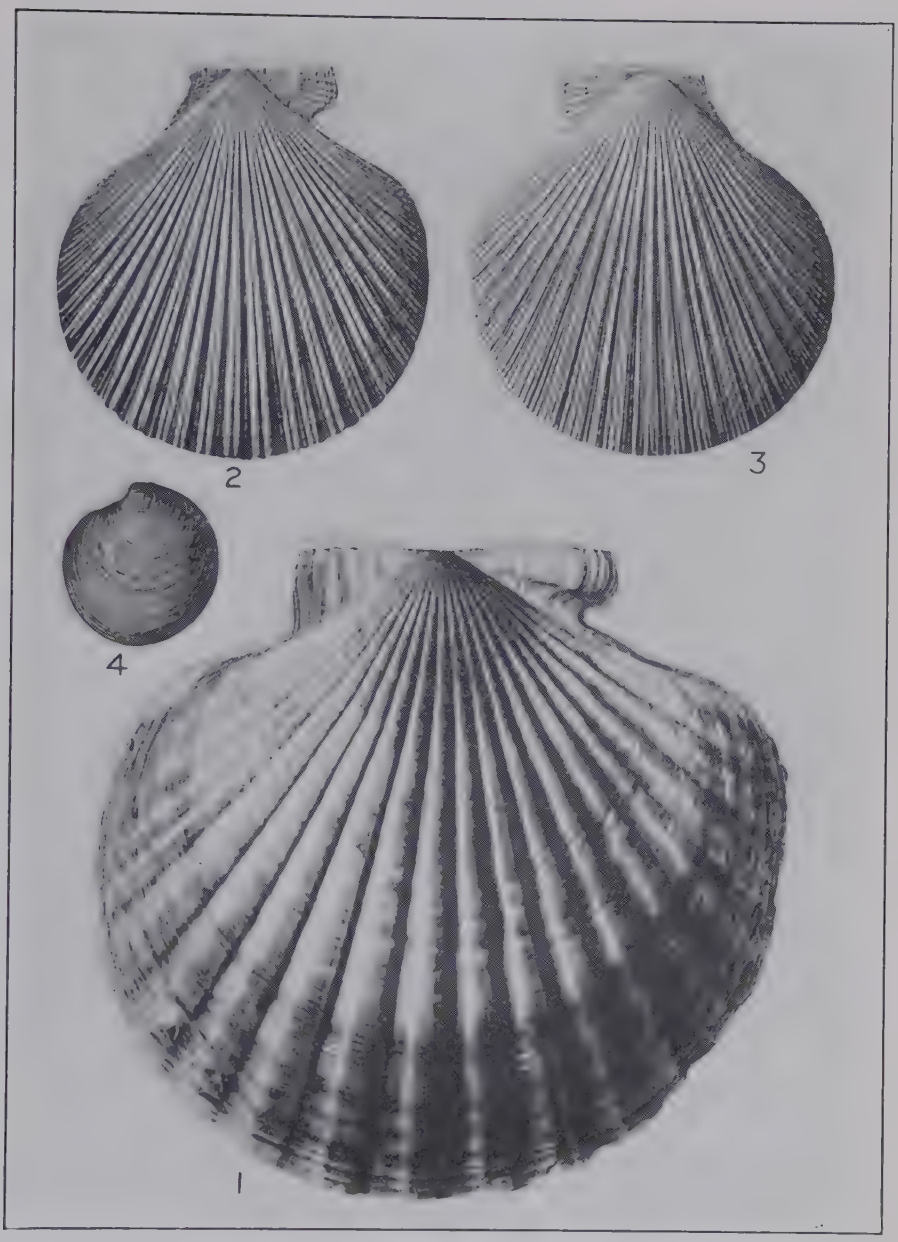


PLATE 4.

Plate 5.

Page

Figure 1. *Yoldia thraciæformis* Storer 27
Puget Sound.

2. *Yoldia scissurata* Dall 31
Puget Sound.

3. *Yoldia ensifera* Dall 32
Puget Sound.

4. *Yoldia beringiana* Dall 28
Off Seattle.

5. *Leda minuta* Fabricius 15
Puget Sound.

6. *Leda fossa* Baird 19
Puget Sound.

7. *Leda cellulita* Dall 16
Puget Sound.

8. *Yoldia myalis* Couthouy 30
Puget Sound.

9. *Acteon punctocoëlatus Carpenter, var.* (In Vol. 2) .....
Nanaimo, B. C.

10. *Lima subauriculata* Montagu 64
Off Nanaimo, B. C.

11. *Nucula castrensis* Hinds 14
Puget Sound.

12. *Nucula tenuis* Montagu 13
Puget Sound.

13. *Cuspidaria oldroydi* Dall 101
Puget Sound.

14. *Cuspidaria californica* Dall 101
Catalina Island.

PLATE 5.

Plate 6.

Page

Figure 1. *Pecten caurinus* Gould 57
Exterior of left valve reduced a little more than half.
Puget Sound.

2. *Modiolus flabellatus* Gould 68
Gould's type figure. U. S. Expl. Exp. Moll.

3. *Psephidia lordi* Baird 161
Proc. U. S. N. M. 26.

4. *Leda hamata* Carpenter 23
Proc. U. S. N. M. 26.

5. *Diplodonta orbella* Gould 124
Boston Jour. Nat. Hist. 6.

6. *Diplodonta orbella* Gould 124
Same as No. 5.

7. *Liocyma scammoni* Dall 159
Am. Jour. Conch.
Port Simpson, British Columbia.

Plate 6.

Plate 7.

Page

Figure 1. *Pecten hericius* Gould 52
Exterior of right valve.
Arnold Tert. Pectens.

2. *Pecten hericius* Gould 52
Exterior of left valve.
Arnold Tert. Pectens.

3. *Pecten hindsii* Carpenter 53
Exterior of left valve.
Arnold Tert. Pectens.

4. *Pecten hindsii* Carpenter 53
Exterior of right valve.
Arnold Tert. Pectens.

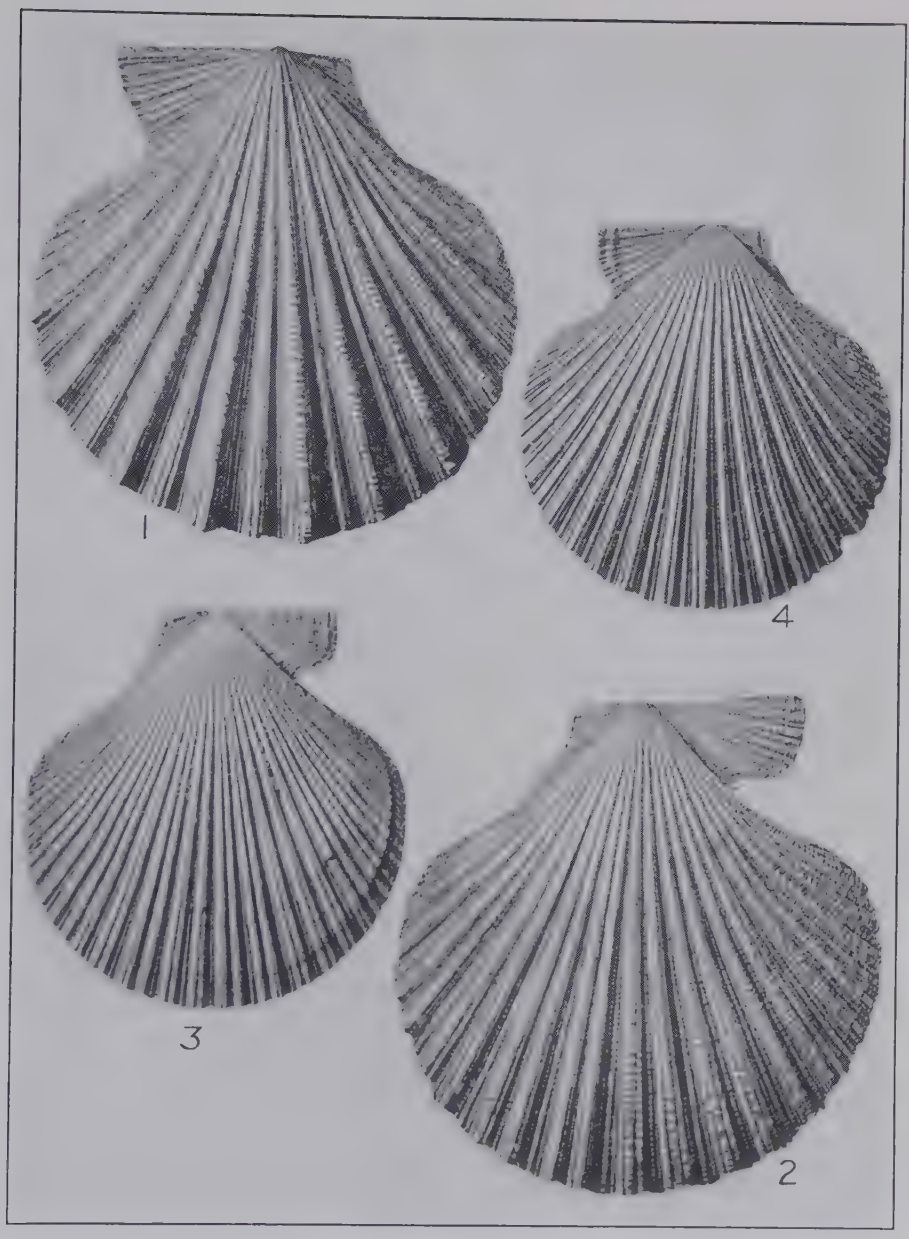


Plate 7.

Plate 8.

Page

Figure 1. *Pecten islandicus* Muller 54
Exterior of right valve.
Arnold Tert. Pectens.

2. *Pecten islandicus* Muller 54
Exterior of left valve.
Arnold Tert. Pectens.

3. *Serripes gronlandicus* Gmelin 145
Puget Sound.

4. *Marcia kennerlyi* (Carpenter) Reeve 155
Puget Sound.

PLATE 8.

Plate 9.

PAGE

FIGURE 1. *Paphia staminea spatiosa* Dall 158
Coos Bay, Oregon.

2. *Macoma brota* Dall 170
Bering Strait.

3. *Semele striosa* C. B. Adams 179
Panama.

4. *Solemya panamensis* Dall 10
Panama Bay.

5. *Cyathodonta dubiosa* Dall 86
Off La Paz, Lower California.

6. *Saxicava arctica* Linnæus 203
Arctic.

Photographs from U. S. N. M. Numbers 1, 2, 4, 5 are type specimens.

Plate 9.

PLATE 10.

PAGE

FIGURE 1. *Thyasira bisecta* Conrad 120
Puget Sound.

2. *Kellia laperousii* Deshayes 131
Puget Sound.

3. *Panomya ampla* Dall 207
Puget Sound.

4. *Mya truncata* Linnæus 197
Puget Sound.

PLATE 10.

Plate 11.

Figure		Page
1.	*Botula diegensis* Dall. Bull. 112 U. S. N. M.	71
2.	*Botula diegensis* Dall. Bull. 112 U. S. N. M.	71
3.	*Poromya leonina* Dall. Bull. 112 U. S. N. M.	96
4.	*Modiolaria impressa* Dall. Bull. 112 U. S. N. M.	75
5.	*Modiolaria impressa* Dall. Bull. 112 U. S. N. M.	75
7.	*Vesicomya stearnsi* Dall. Bull. 112 U. S. N. M.	148
8.	*Vesicomya stearnsi* Dall. Bull. 112 U. S. N. M.	148
9.	*Semele rupicola* Dall. San Diego.	180
10.	*Semele rupicola* Dall. San Diego.	180
11.	*Pseudopythina compressa* Dall. Puget Sound.	136
12.	*Semele incongrua* Carpenter	181
13.	*Semele incongrua* Carpenter	181

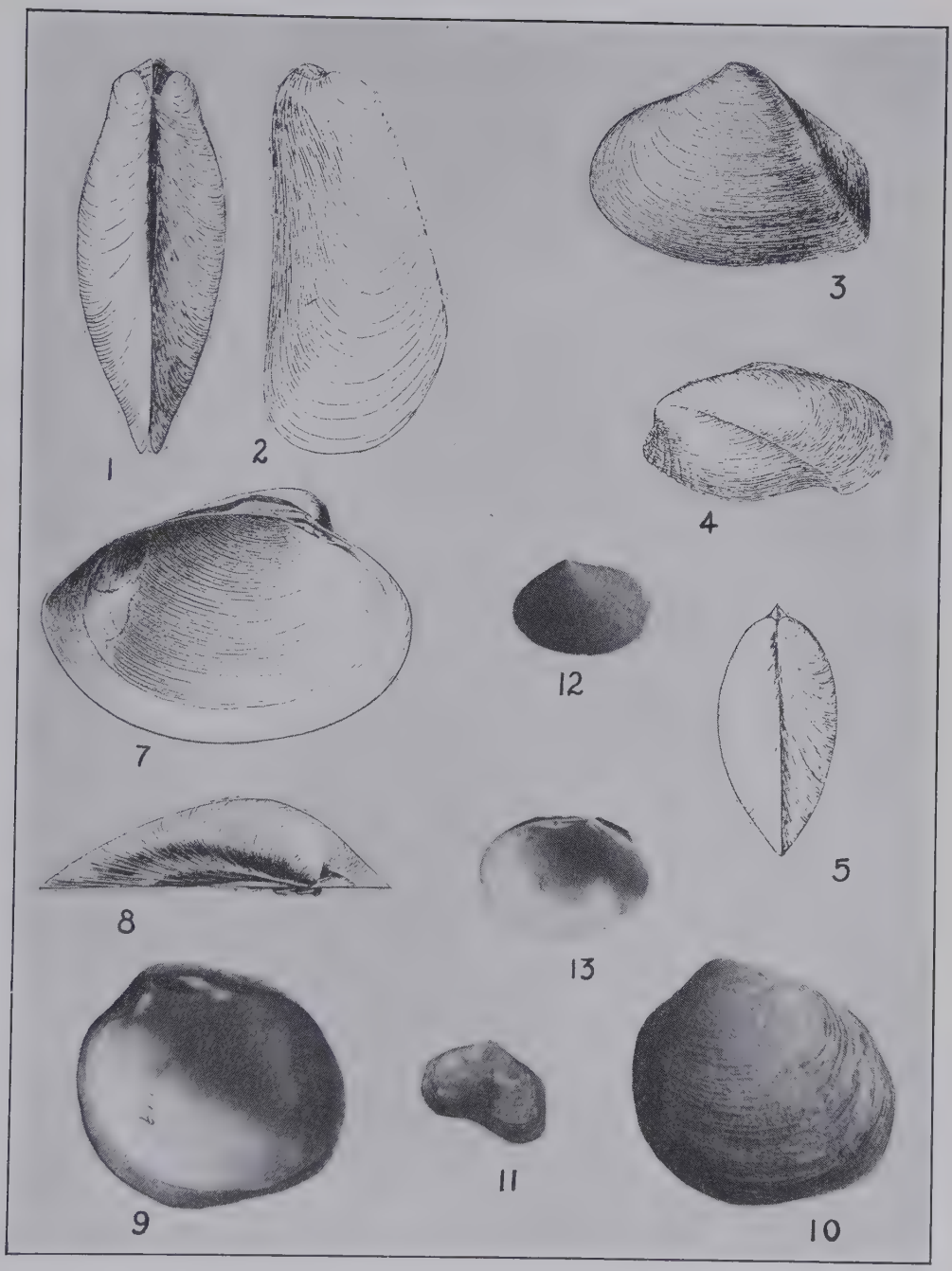


Plate 11.

Plate 12.

Page

Figure 1. *Pecten hindsii kincaidi* Oldroyd 53
Type specimen, Puget Sound.
2. *Pecten hindsii kincaidi* Oldroyd 53
3. *Pecten alaskensis* Dall 63
Bull. 112 U. S. N. M.
4. *Pecten islandicus pugetensis* Oldroyd 55
Type specimen, Puget Sound.
5. *Pecten islandicus pugetensis* Oldroyd 55
6. *Pecten vancouverensis* Whiteaves 60
Bull. 112 U. S. N. M.
7. *Pecten vancouverensis* Whiteaves 60
8. *Pecten albidus* Dall 52
Arnold, Tert. Pectens.
9. *Pecten albidus* Dall 52

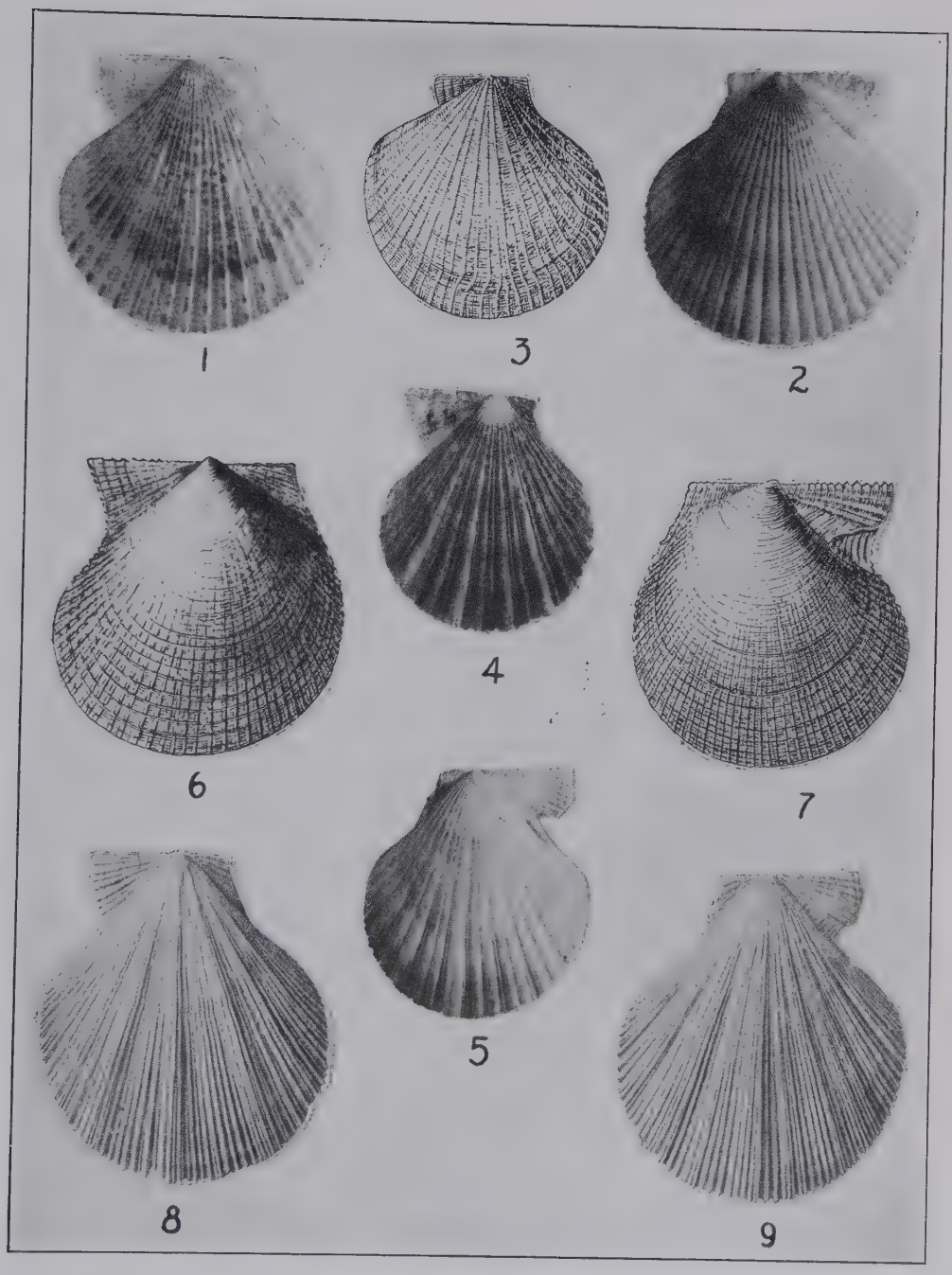


PLATE 12.

Plate 13.

		Page
Figure 1.	*Leda dalli* Krause	24
	Photograph, U. S. N. M., of Krause's type figure.	
2.	*Leda dalli* Krause	24
3.	*Leda dalli* Krause	24
4.	*Cuspidaria beringensis* Leche	100
	Photograph, U. S. N. M., of Leche's type specimen.	
5.	*Cuspidaria beringensis* Leche	100
6.	*Nucula expansa* Reeve	14
	Photograph, Am. Mus. Nat. Hist., New York.	
7.	*Nucula expansa* Reeve	14
8.	*Cuspidaria nana* Oldroyd	99
	Type specimen, Monterey, California.	
9.	*Cuspidaria nana* Oldroyd	99
10.	*Pholadidea rostrata* Valenciennes	213
	Photograph, Am. Mus. Nat. Hist., New York, of Valenciennes type figure.	
11.	*Pholadidea rostrata* Valenciennes	213
12.	*Venericardia crebricostata* Krause	114
	U. S. N. M.	
13.	*Venericardia paucicostata* Krause	112
	U. S. N. M.	
14.	*Macoma alaskana* Dall	177
	U. S. N. M. 23.	
15.	*Macoma inflatula* Dall	174
	Bull. Nat. Hist. Soc., British Columbia, No. 2.	
16.	*Malletia faba* Dall	37
	Bull. Nat. Hist. Soc., British Columbia, No. 2.	
17.	*Malletia pacifica* Dall	37
	Bull. Nat. Hist. Soc., British Columbia, No. 2.	
18.	*Leda leonina* Dall	21
	U. S. N. M.	
19.	*Astarte esquimalti* Baird	108
	Proc. U. S. N. M. 26. Puget Sound.	
20.	*Astarte alaskensis* Dall	106
	Proc. U. S. N. M. 26. Bering Sea.	
21.	*Modiolaria nigra* Gray	74
	Puget Sound.	

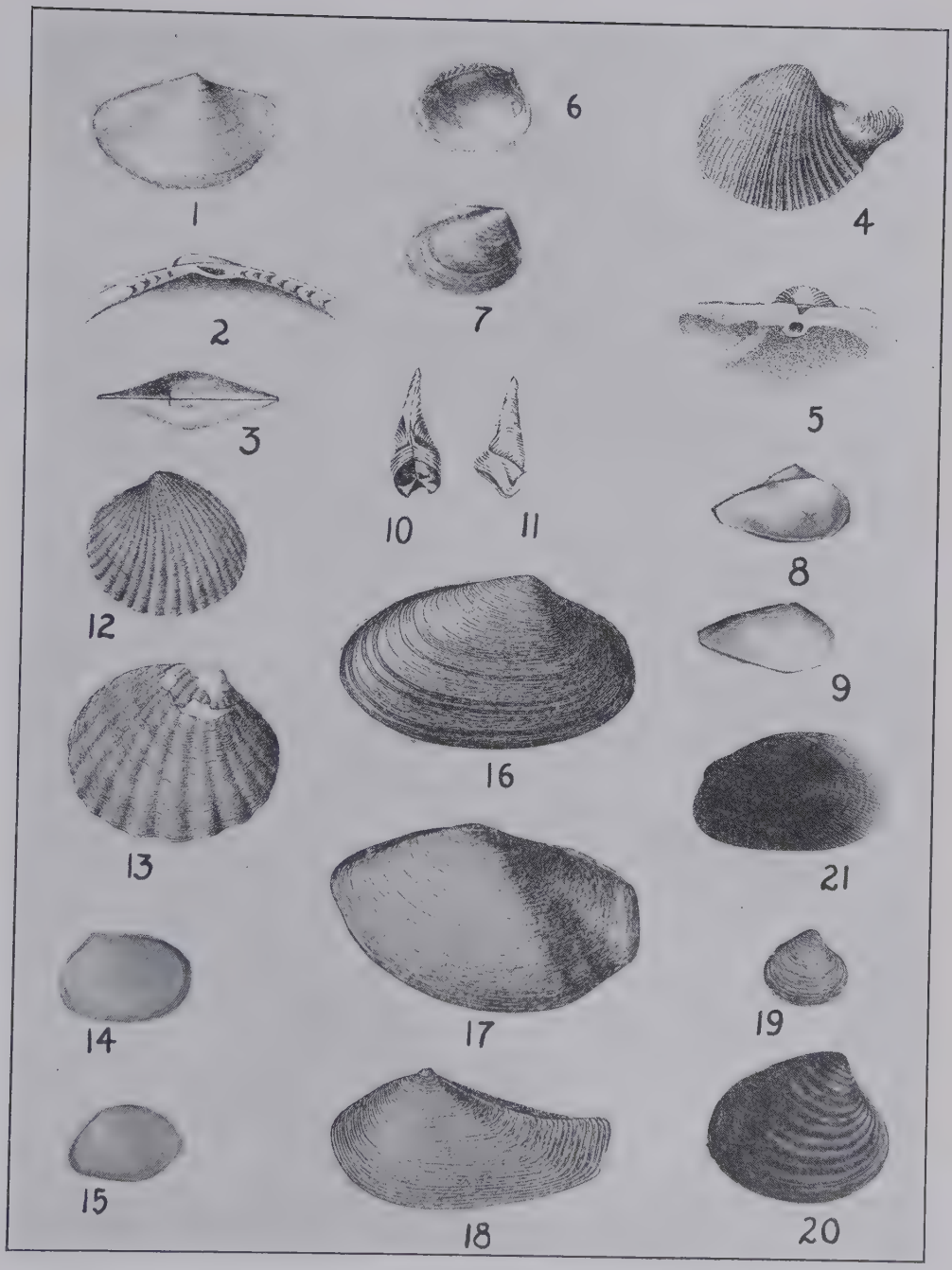


Plate 13.

Plate 14.

Page

Figure 1. *Solemya johnsoni* Dall 9
Proc. U. S. N. M. 17.
2. *Limopsis vaginatus* Dall 44
Proc. U. S. N. M. 17.
3. *Limopsis vaginatus* Dall 44
4. *Tellina idæ* Dall 164
Proc. U. S. N. M. 14. Long Beach, California.
5. *Pecten randolphi* Dall 59
Proc. U. S. N. M. 24 Puget Sound
6. *Pecten randolphi* Dall 59
7. *Venus kennicottii* Dall 155
Amer. Jour. Conch. 7.
8. *Modiolaria corrugata* Stimpson 77
Am. Mus. Nat. Hist., New York.
9. *Modiolaria corrugata* Stimpson 77

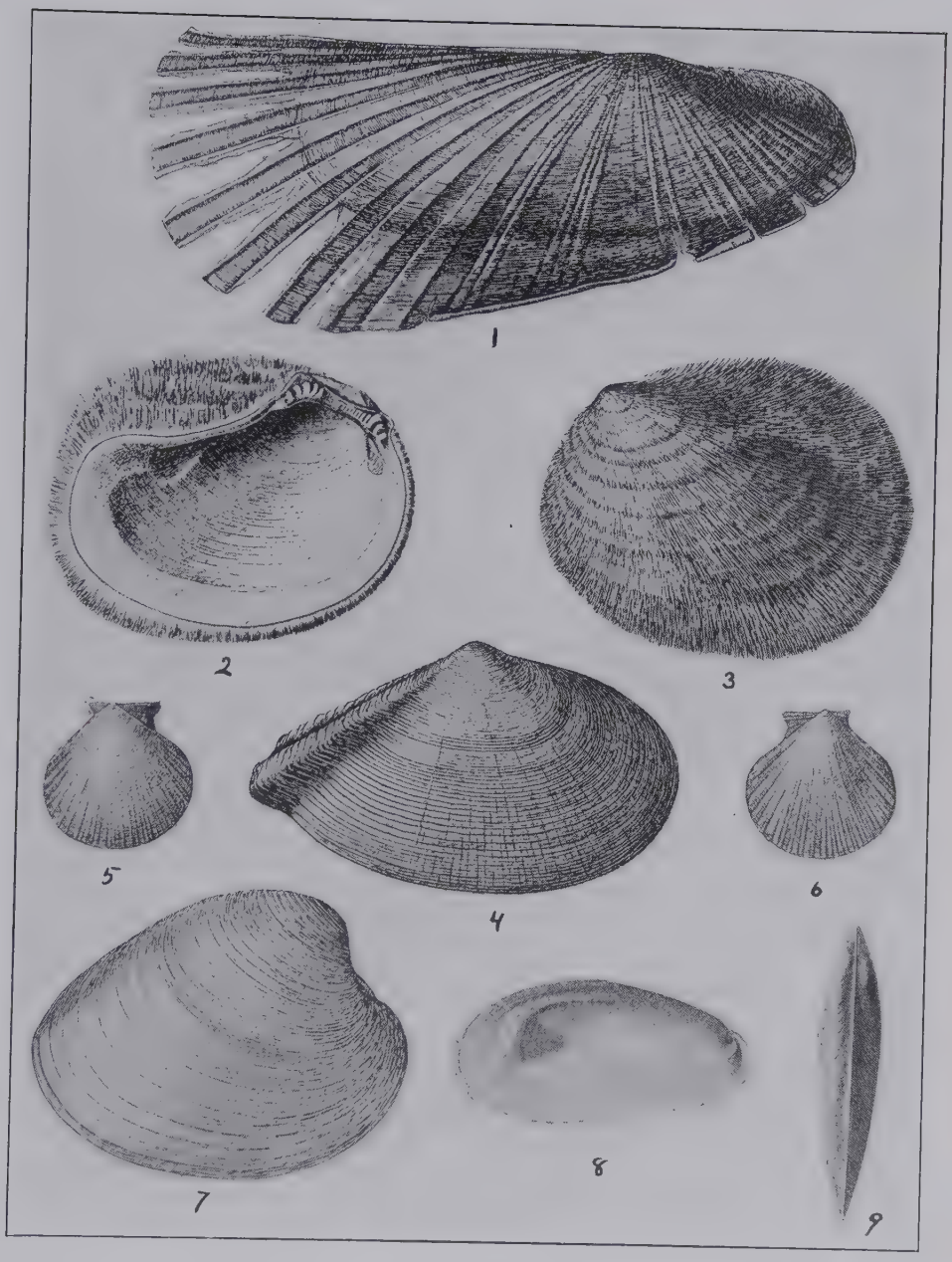


PLATE 14.

Plate 15.

		Page
Figure 1.	*Grippina californica* Dall. Drawing, U. S. N. M., greatly enlarged.	205
2.	*Grippina californica* Dall	205
3.	*Grippina californica* Dall	205
4.	*Crenella columbiana* Dall. Puget Sound.	80
5.	*Mya intermedia* Dall. Puget Sound.	199
6.	*Phacoides tenuisculptus* Carpenter. Proc. U. S. N. M. 23.	128
7.	*Bernardina bakeri* Dall. Drawing, U. S. N. M., greatly enlarged.	108
8.	*Bernardina bakeri* Dall	108
9.	*Pseudopythina rugifera* Carpenter. On foot of sea mouse, Puget Sound.	136
10.	*Pandora grandis* Dall. Puget Sound.	87
11.	*Pandora glacialis* Leach. Puget Sound.	89
12.	*Spisula alaskana* Dall. Vancouver Island, B. C.	193

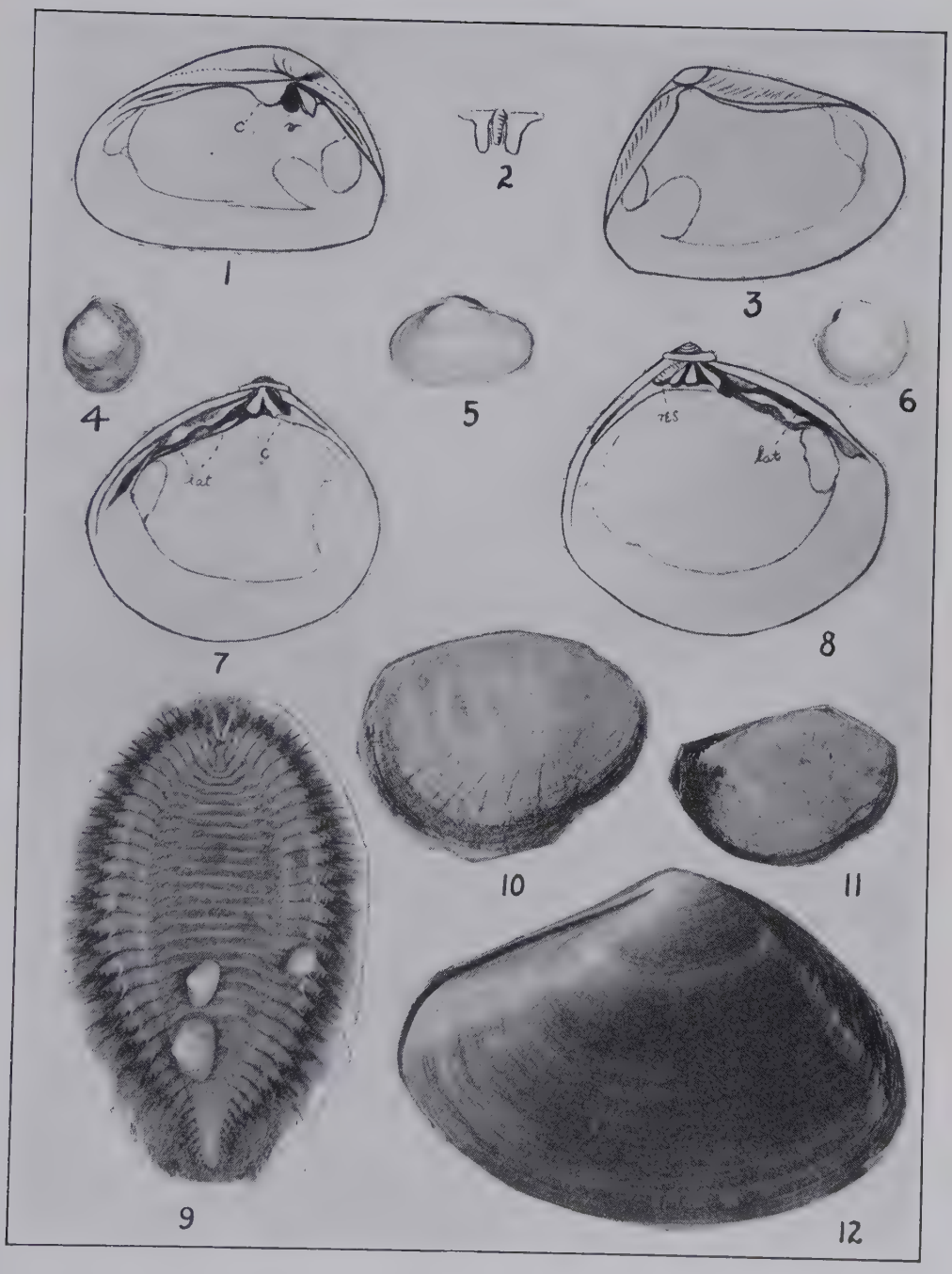


Plate 15.

Plate 16.

Page

Figure 1. *Terebratalia transversa* Sowerby 227
2. *Terebratalia transversa* Sowerby 227
3. *Terebratalia transversa* Sowerby 227
4. *Terebratalia caurina* Gould 228
5. *Terebratalia caurina* Gould 228
6. *Terebratalia caurina* Gould 228
7. *Terebratalia caurina* Gould 228
8. *Hemithyris psittacea* Gmelin 223
9. *Hemithyris psittacea* Gmelin 223
10. *Hemithyris psittacea* Gmelin 223
11. *Hemithyris psittacea* Gmelin 223
12. *Hemithyris psittacea* Gmelin 223
Photograph from Davidson, Mon. Rec. Brach.
13. *Terebratulina kiiensis* Dall and Pilsbry 226
14. *Terebratulina kiiensis* Dall and Pilsbry 226
Proc. U. S. N. M., vol. 17.

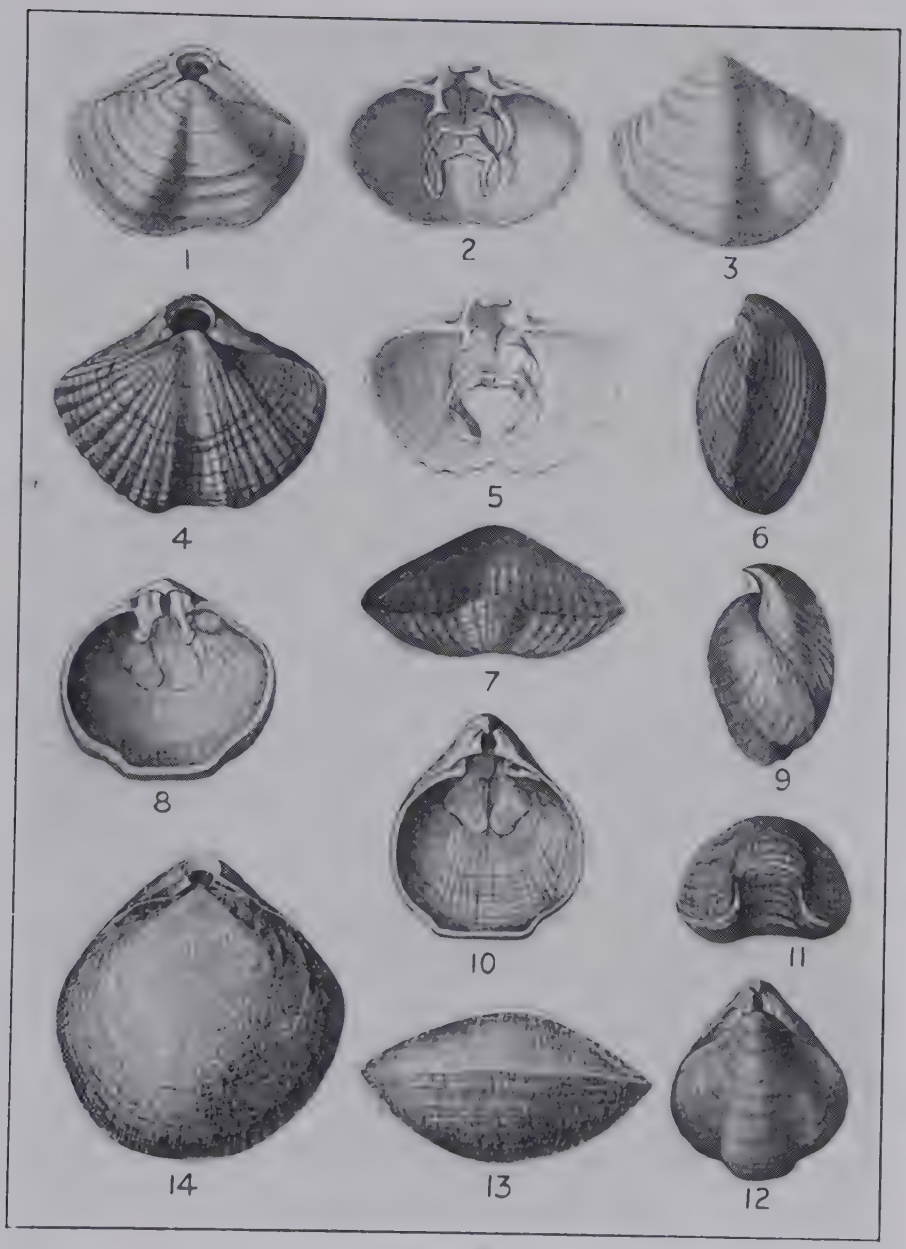


PLATE 16.

Plate 17.

Page

Figure 1. *Laqueus californicus* Koch 230
2. *Laqueus californicus* Koch 230
3. *Laqueus californicus* Koch 230
4. *Laqueus californicus* Koch 230
5. *Laqueus californicus vancouverensis* Davidson 231
6. *Laqueus* var. *vancouverensis* Davidson 231
7. *Laqueus* var. *vancouverensis* Davidson 231
8. *Laqueus* var. *vancouverensis* Davidson 231
9. *Laqueus* var. *vancouverensis* Davidson 231
10. *Laqueus* var. *vancouverensis* Davidson 231

Photographs from Davidson Recent Brach.

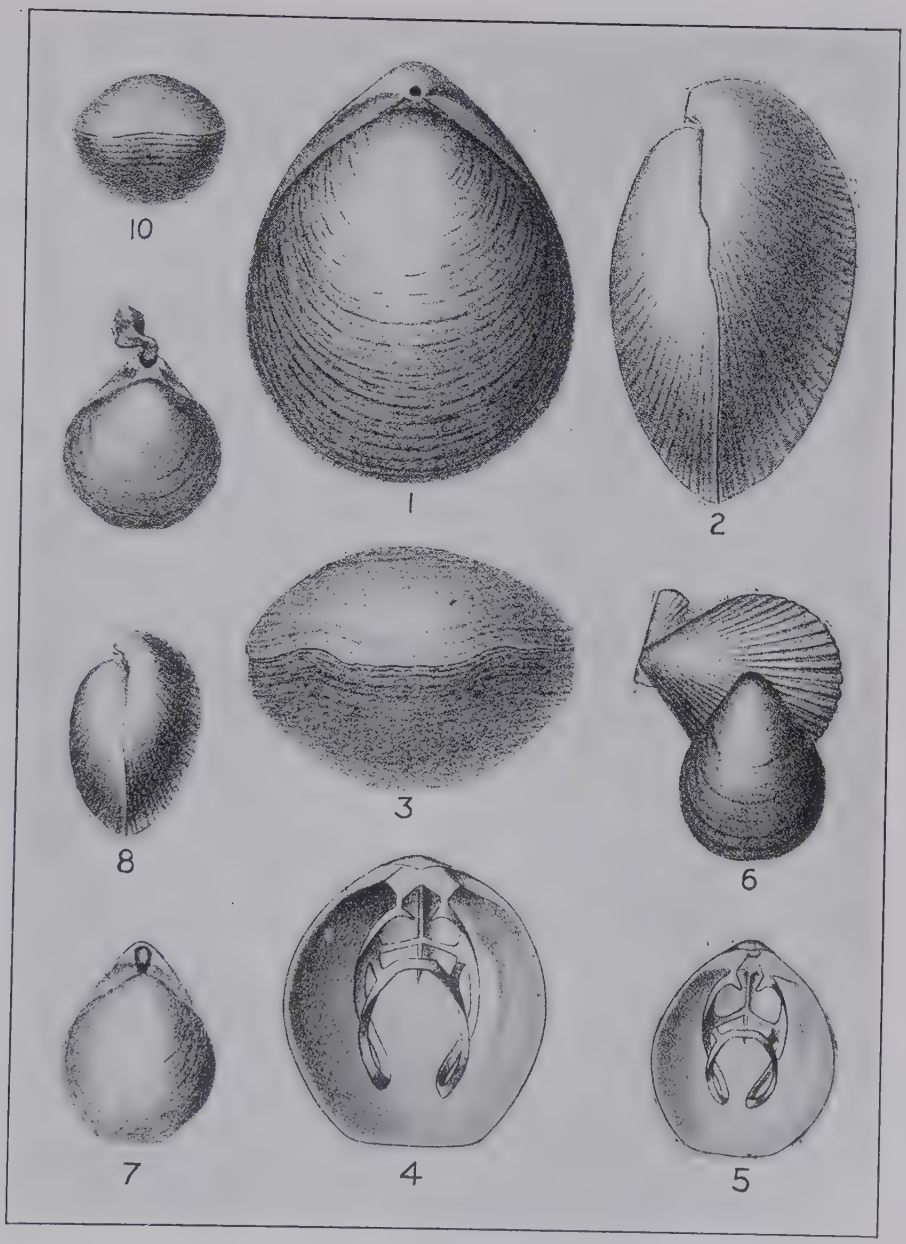


PLATE 17.

PLATE 18.

PAGE

FIGURE 1. *Solen sicarius* Gould.....188

2a. *Siliqua nuttallii* Conrad.....190

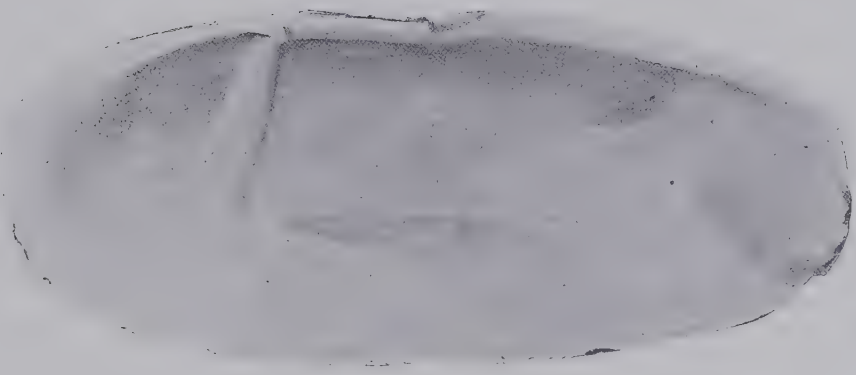
Interior of right valve.

2b. *Siliqua nuttallii* Conrad.....190

Exterior of right valve.

Plate from University of California.

1



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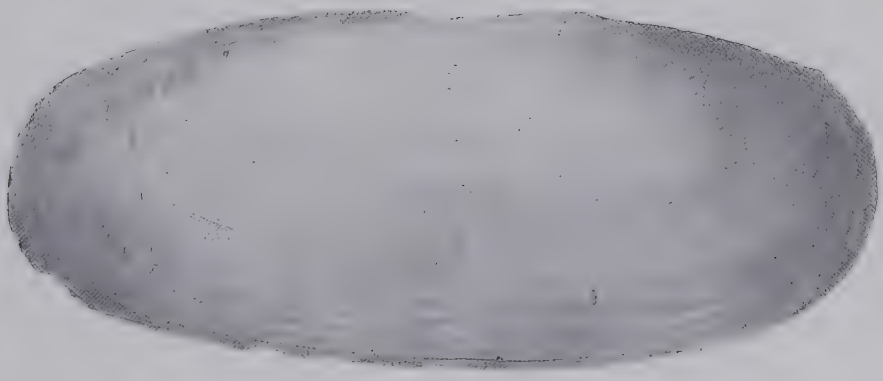

2b

PLATE 18.

Plate 19.

		Page
Figure	1. *Yoldia limatula* Say	31
	1a. *Yoldia limatula* Say	31
	1b. *Yoldia limatula* Say	31
	2. *Leda minuta* Fabricius	15
	2a. *Leda minuta* Fabricius	15
	3. *Cuspidaria glacialis* G. O. Sars	98
	3a. *Cuspidaria glacialis* G. O. Sars	98
	Sars type figures.	
	4. *Astarte fabula* Reeve	107
	4a. *Astarte fabula* Reeve	107
	5. *Astarte globosa* Moller	108
	5a. *Astarte globosa* Moller	108
	6. *Leda arctica* Gray	26
	6a. *Leda arctica* Gray	26
	7. *Leda pernula* Müller	19
	7a. *Leda pernula* Müller	19
	8. *Cardium ciliatum* Fabricius	142
	8a. *Cardium ciliatum* Fabricius	142
	American Mus. Nat. Hist., New York, from type figures.	

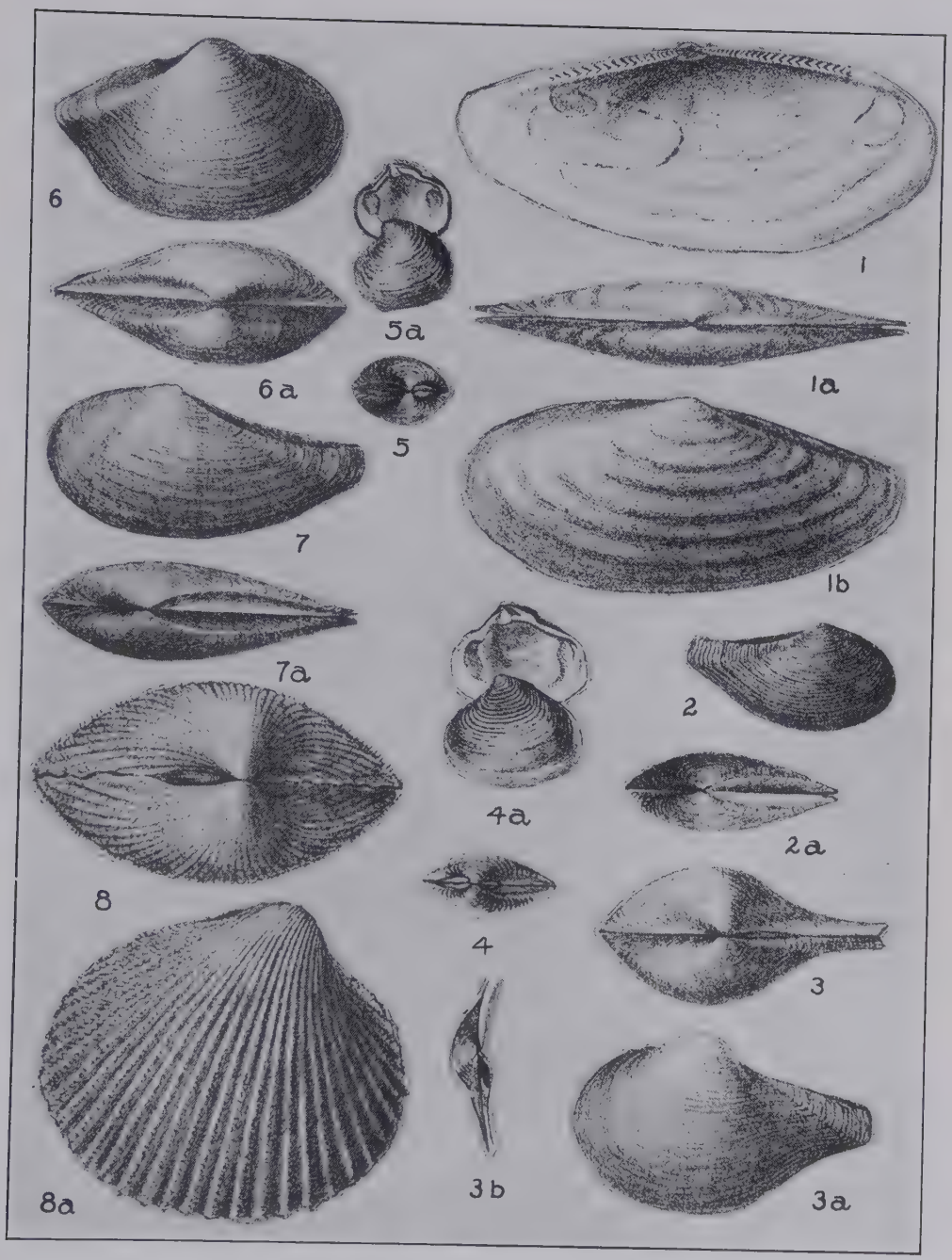

PLATE 19.

Plate 20.

Page

Figure 1. *Spisula falcata* Gould 195
Interior of left valve.

2. *Spisula falcata* Gould 195
Hinge.

3. *Spisula falcata* Gould 195
Exterior of left valve.
Figures 1, 2, 3, are figures of Gould's types.

4. *Mactra californica* Conrad 192
Interior of right valve.

5. *Mactra californica* Conrad 192
Exterior of left valve.

6. *Mactra californica* Conrad 192
Interior of left valve.
Figures 4, 5, 6 from University of California, Vol. 9, Packard.

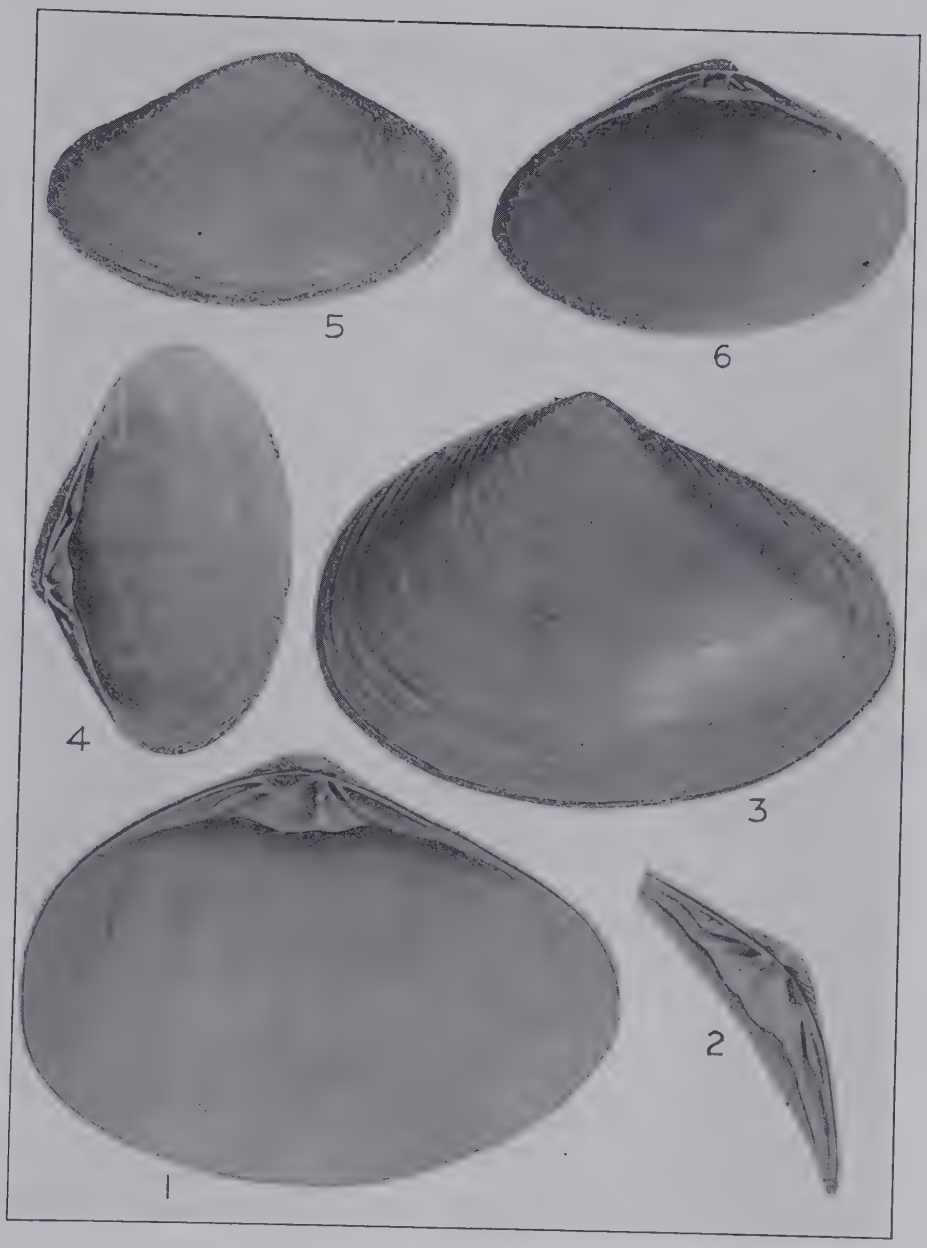

PLATE 20.

Plate 21.

Page

Figure 1. *Cuspidaria subglacialis* Dall 98
Bull. 112, U. S. N. M.

2. *Barnea pacifica* Stearns 209

3. *Barnea pacifica* Stearns 209

4. *Barnea pacifica* Stearns 209
Figures 2, 3, 4 are from Stearns' type specimen.

5. *Pholadidea ovoidea* Gould 212
Boston Jour. Nat. Hist.

6. *Pholadidea ovoidea* Gould 212
Figures 5, 6 are from Gould's type figure.

7. *Rochefortia compressa* Dall 134
Bull. 112, U. S. N. M.

8. *Botula falcata* Gould 71
Boston Jour. Nat. Hist.

9. *Botula falcata* Gould 71
Figures 8, 9 are from Gould's type figure.

10. *Pholadidea penita* Conrad 211
Jour. Acad. Nat. Sci., Phila.
From Conrad's type figure.

11. *Labiosa undulata* Gould 191
Boston Jour. Nat. Hist.
From Gould's type figure.

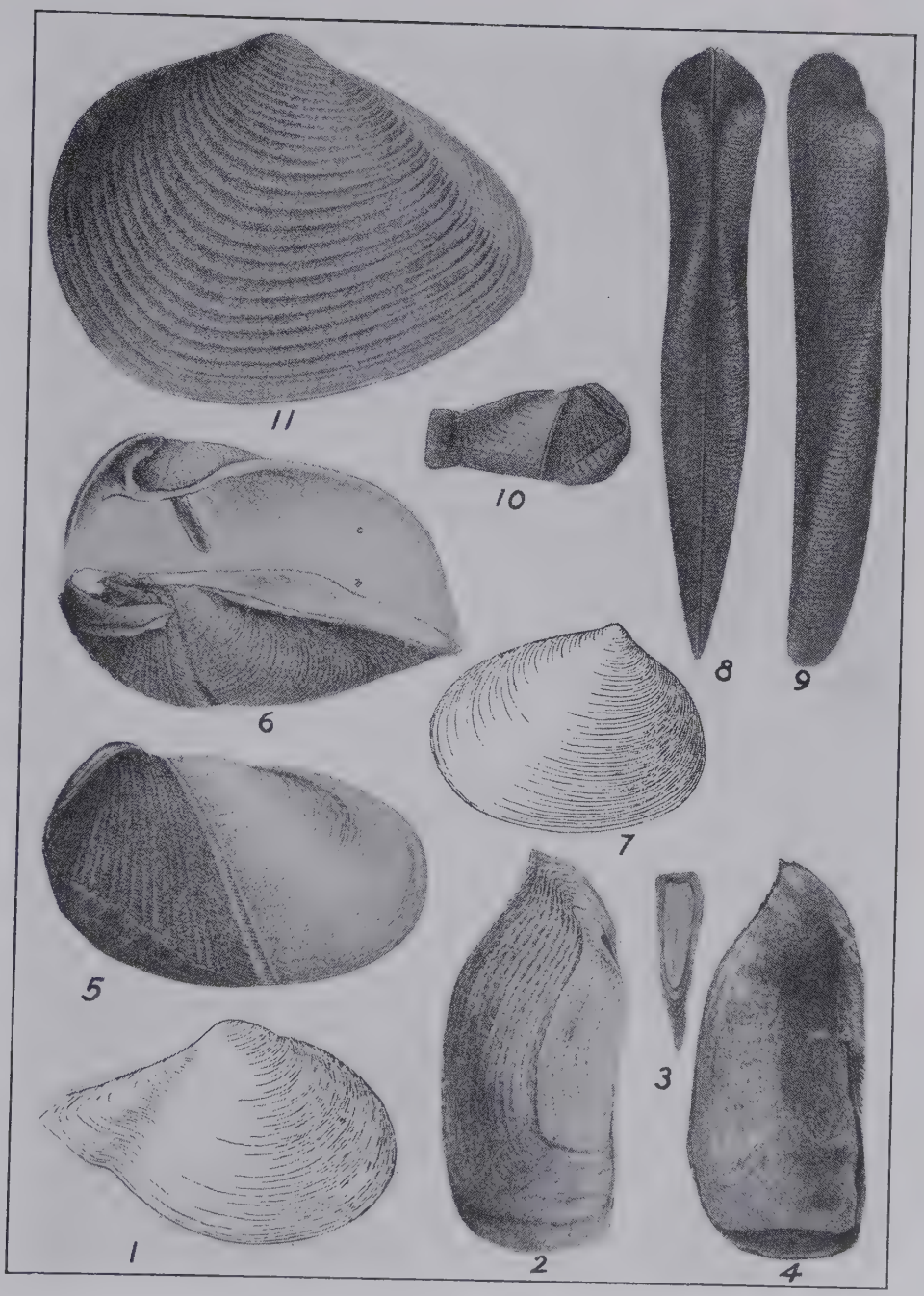

PLATE 21.

Plate 22.

Page

Figure 1. *Periploma planiuscula* Sowerby 82
Jour. Acad. Nat. Sci., Phila.
This is Periploma argentaria Conrad.

2. *Pecten latiauritus* Conrad 57
From Conrad's type figure.
Jour. Acad. Nat. Sci., Phila.

3. *Psephidea cymata* Dall 161
Bull. 112, U. S. N. M.

4. *Pholadidea penita concamerata* Deshayes 211
Conch. Iconica.

5. *Pholadidea penita concamerata* Deshayes 211
Conch. Iconica.

6. *Calyptogena elongata* Dall 116
Bull. 112, U. S. N. M.

7. *Parapholas californica* Conrad. Chimney 210
From type figure.
Jour. Acad. Nat. Sci., Phila.

8. *Macoma liotricha* Dall 176
Bull. 2, Nat. Hist. Soc., British Columbia.

9. *Pholadidea melanura* Sowerby 212
Conch. Iconica.

10. *Pholadidea melanura* Sowerby 212
Conch. Iconica.

11. *Pholadidea parva* Tryon 213
From type figure.
Amer. Jour. Conch.

12. *Parapholas parva* Tryon 213
Amer. Jour. Conch. type figure.

13. *Parapholas californica* Conrad 210
From type figure.
Jour. Acad. Nat. Sci., Phila.

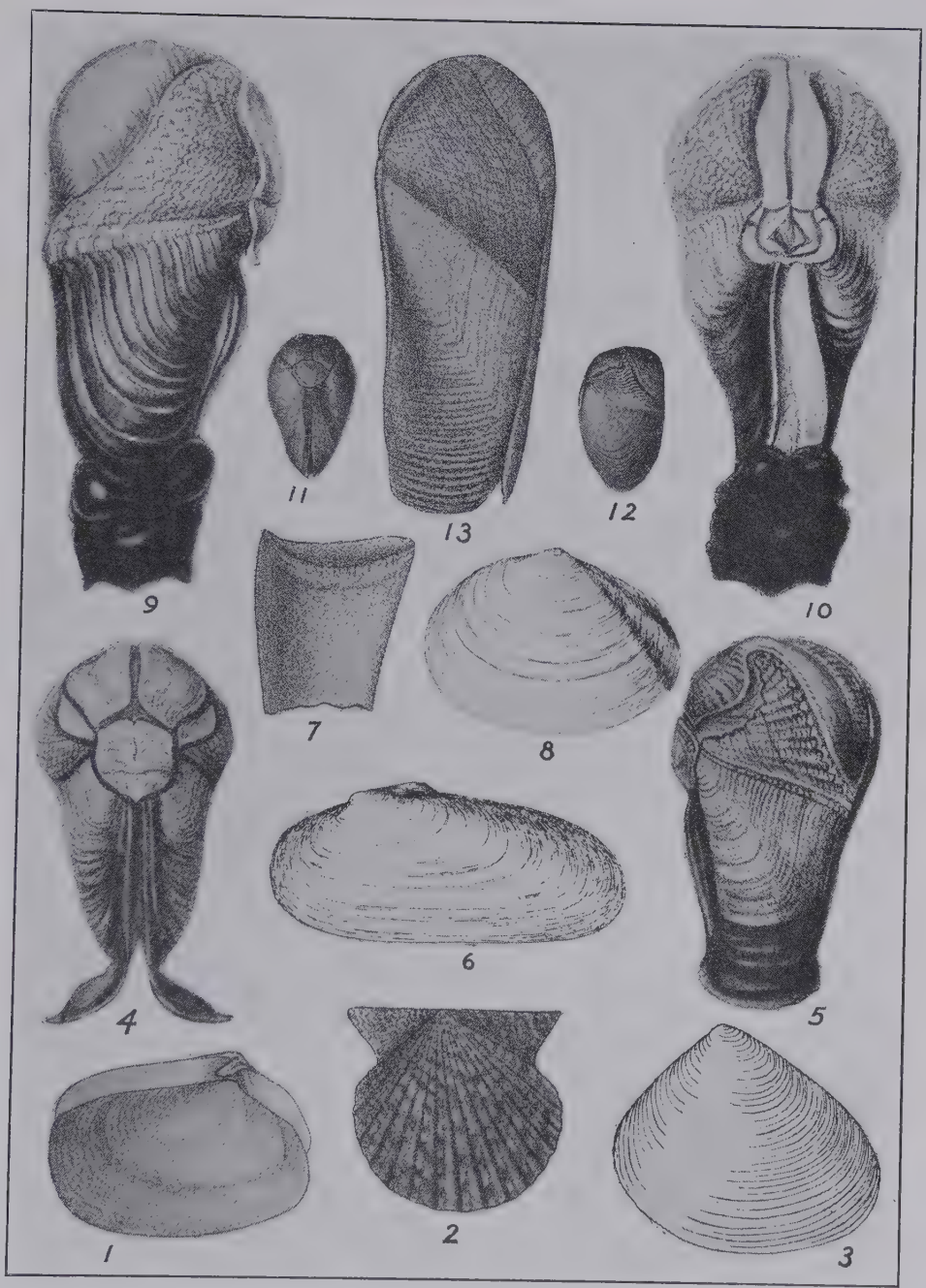

PLATE 22.

Plate 23.

Page

Figure 1. *Spisula voyi* Gabb.....193

2. *Spisula voyi* Gabb.....193

This plate from University of California Publ. Vol. 9, Geology.

1

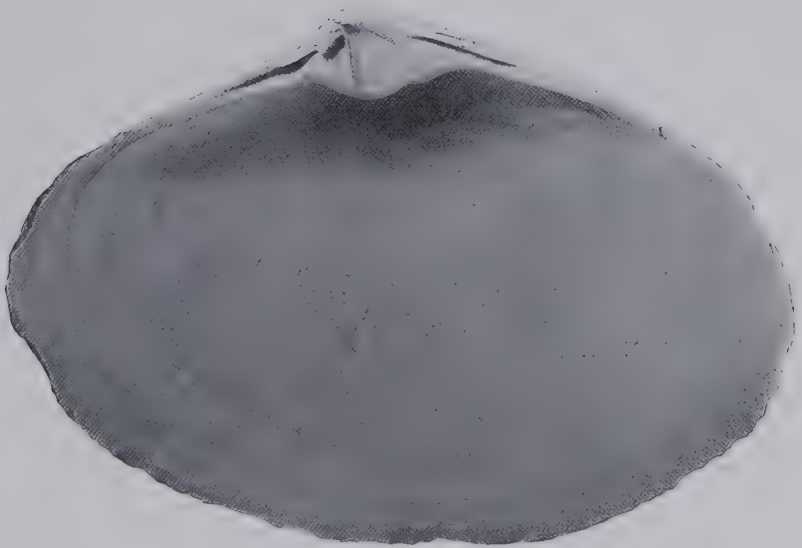

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PLATE 23.

Plate 24.

Page

Spisula catilliformis Conrad 194

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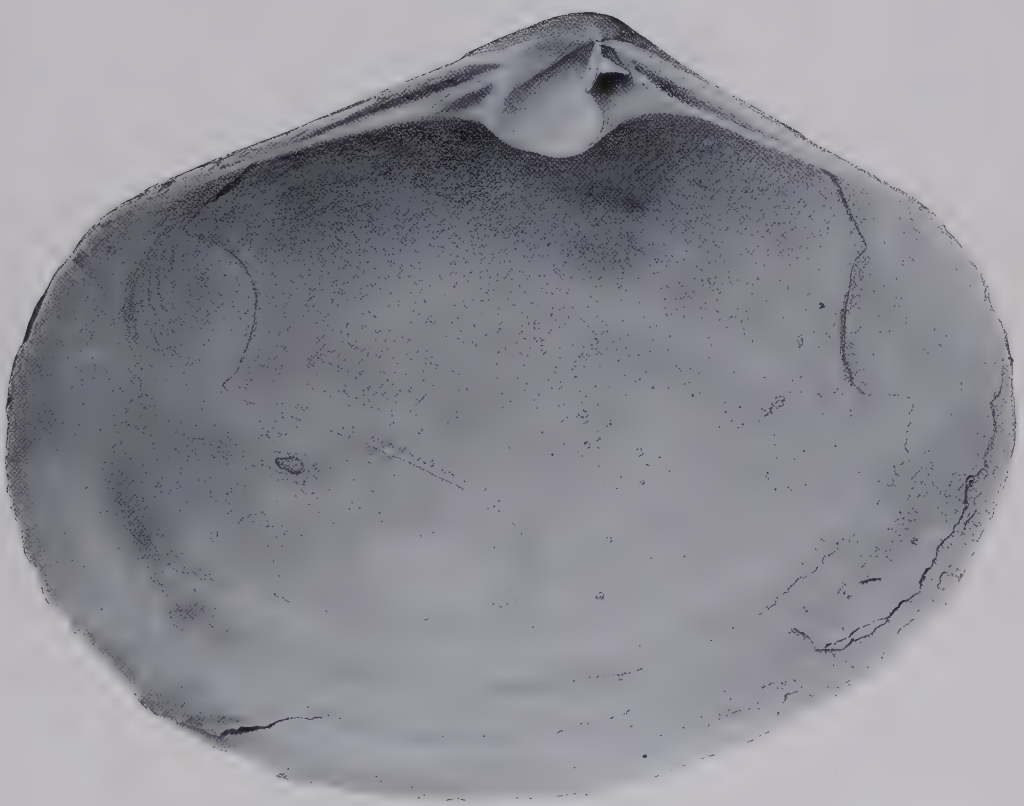


PLATE 24.

Plate 25.

Page

Figure 1a. *Hinnites giganteus* Gray 63

1b. *Hinnites giganteus* Gray 63

This plate is from the University of California.

1a

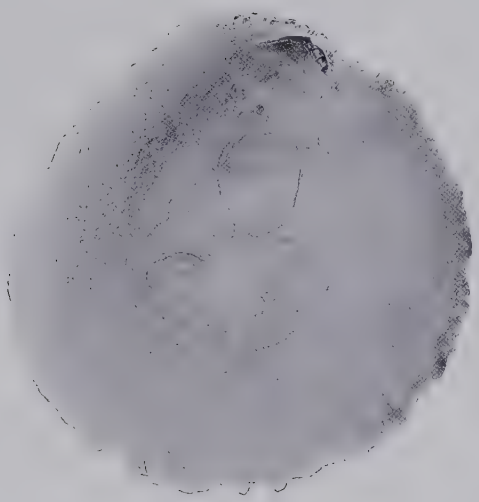
1b

PLATE 25.

Plate 26.

		Page
Figure	1a. *Pododesmus macroschisma* Deshayes	65
	1b. *Pododesmus macroschisma* Deshayes	65

This plate is from the University of California.



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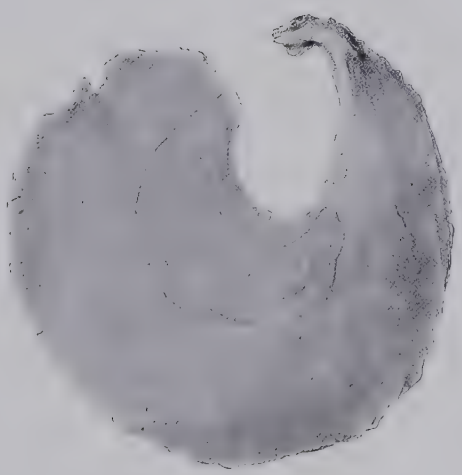

1b

PLATE 26.

Plate 27.

Page

Figure 1. *Modiolus demissus* Dillwyn 70
Exterior of left valve.

2. *Mytilus californianus* Conrad 66
Exterior of left valve.

3. *Lyonsia californica* Conrad 91

4. *Mytilus edulis* Linnæus 66
Exterior of left valve.

5. *Botula californiensis* Philippi 71

This plate from University of California Publ.
Vol. 14, Zoology, Packard.

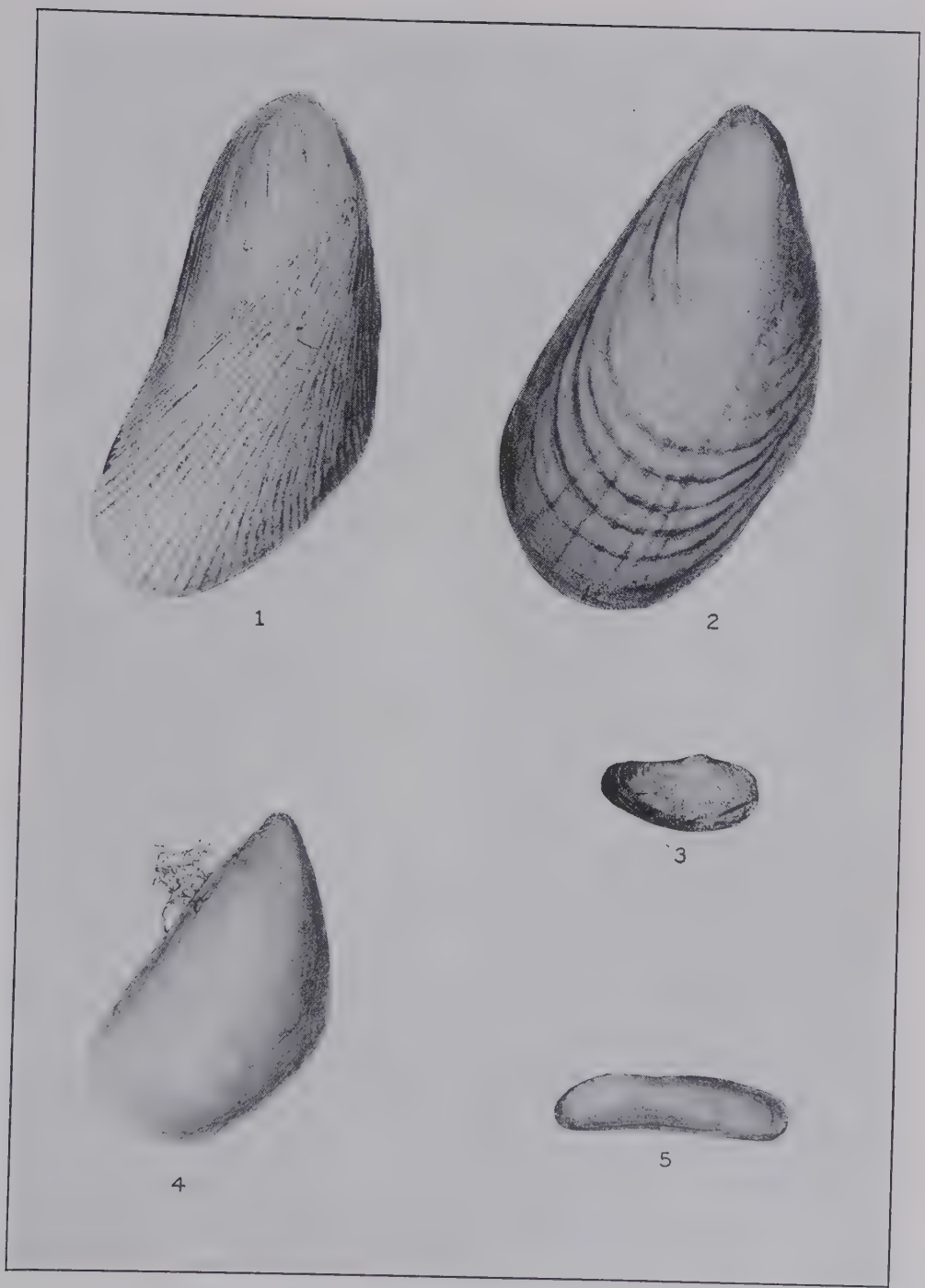

PLATE 27.

Plate 28.

Page

Figure 1. *Modiolaria seminuda* Dall 78

2. *Lyonsia pugetensis* Dall 91

Puget Sound.

3. *Leda extenuata* Dall 22

4. *Yoldia montereyensis* Dall 28

5. *Pecten jordani* Arnold 55

Puget Sound.

6. *Pecten jordani* Arnold 55

Puget Sound.

7. *Nucula carlottensis* Dall 13

8. *Nucula carlottensis* Dall 13

9. *Modiolaria taylori* Dall 76

Enlarged.

10. *Modiolaria taylori* Dall 76

Enlarged.

11. *Modiolaria vernicosa* Middendorff 78

12. *Atrina oldroydi* Dall 47

Off Point Fermin, San Pedro.

Reduced about one-half.

Figures 1, 3, 4, 7, 8, 9, 10, 11 are from U. S. N. M. Proc.

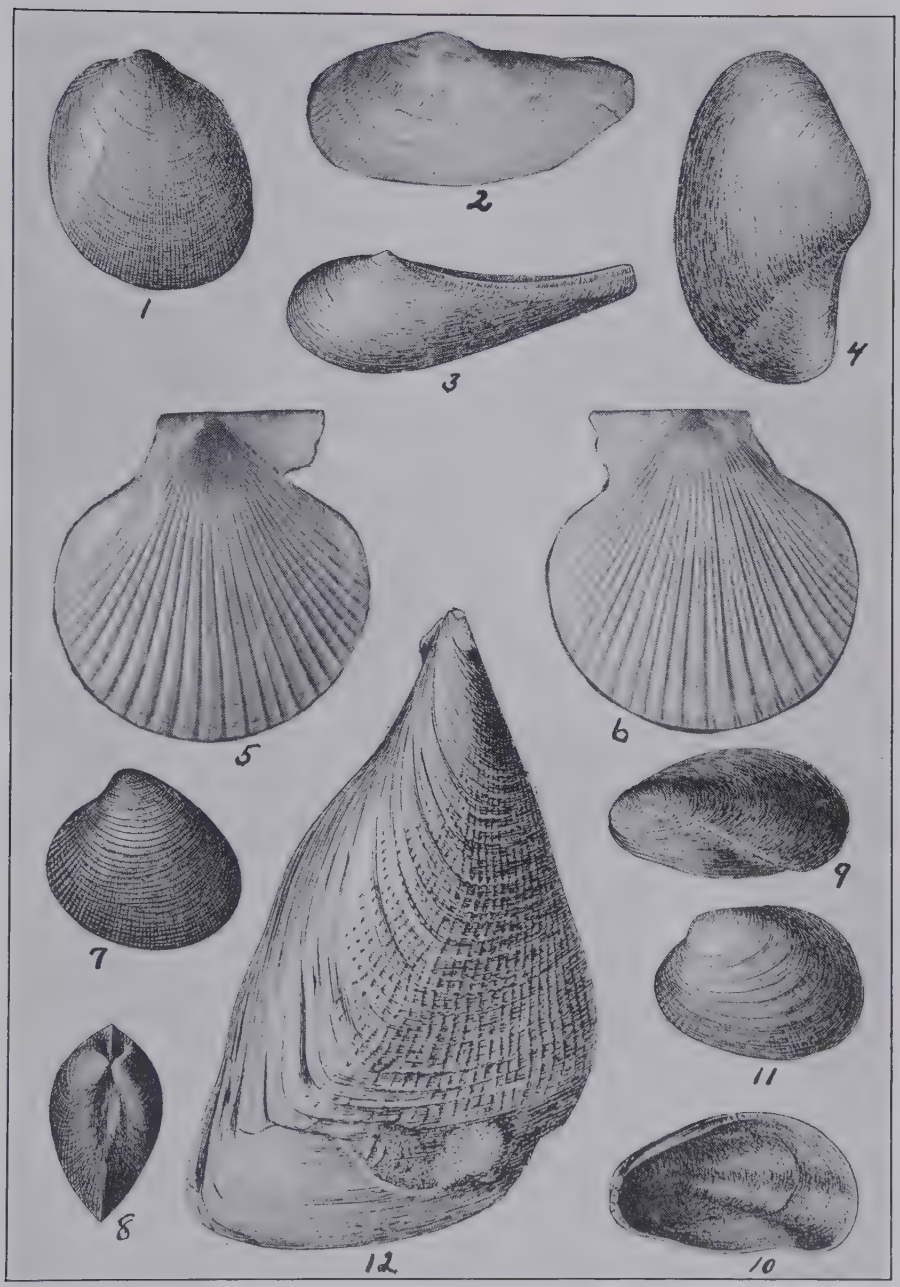

PLATE 28.

Plate 29.

Page

Figure 1. *Pecten hastatus* Sowerby 53
Arnold Tert. Pectens California.

2. *Tellina carpenteri* Dall 166
San Pedro.

3. *Pecten hastatus* Sowerby 53
Arnold Tert. Pectens California.

4. *Mytilus adamsianus* Dunker 67
Conch. Iconica.

5. *Pecten diegensis* Dall 51

6. *Limopsis diegensis* Dall 43
Bull. Mus. Comp. Zool., vol. 43.

7. *Limopsis diegensis* Dall 43
Bull. Mus. Comp. Zool., vol. 43.

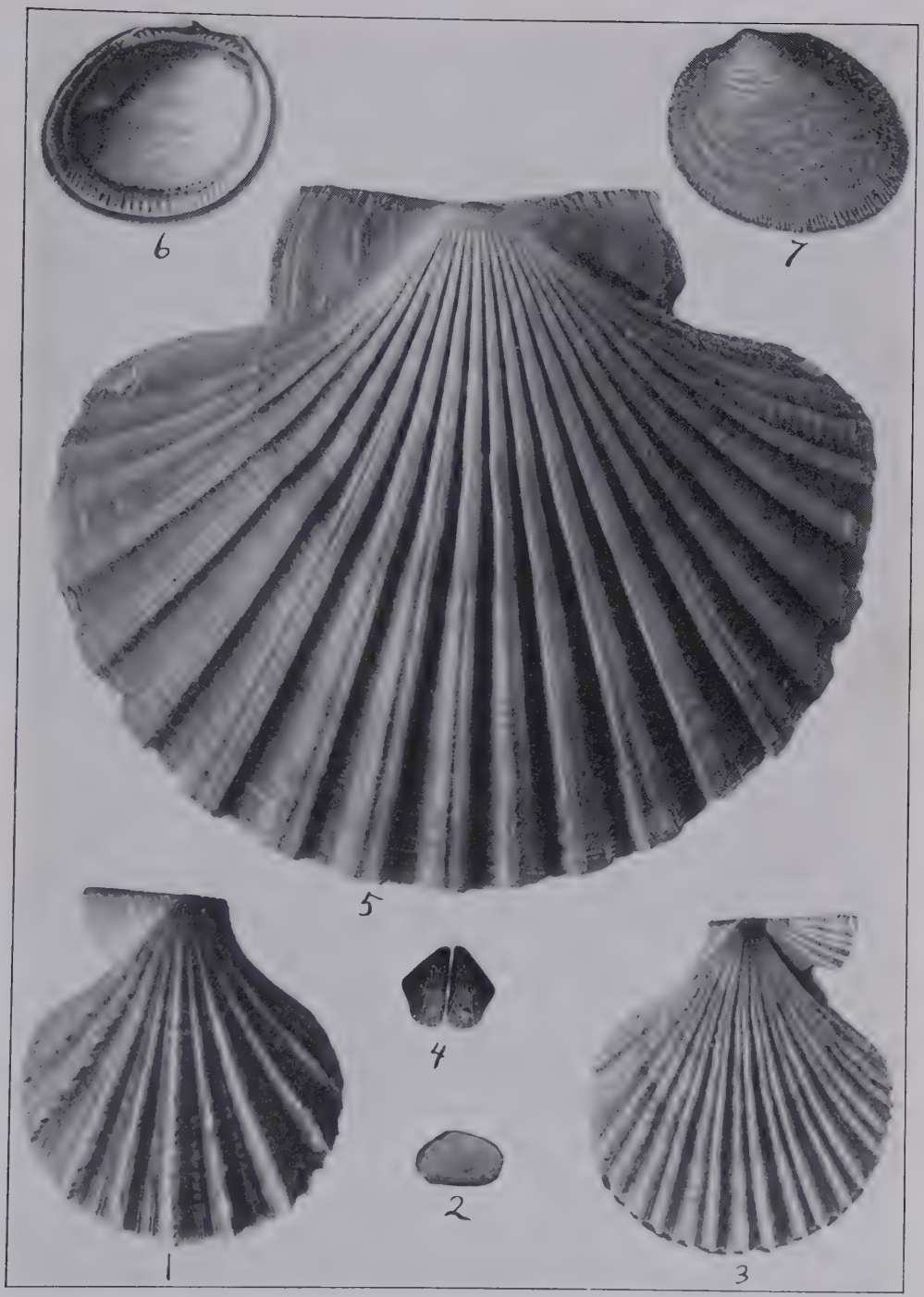

PLATE 29.

Plate 30.

Page

Figure 1a. *Paphia tenerrima* Carpenter 156

1b. *Paphia tenerrima* Carpenter 156

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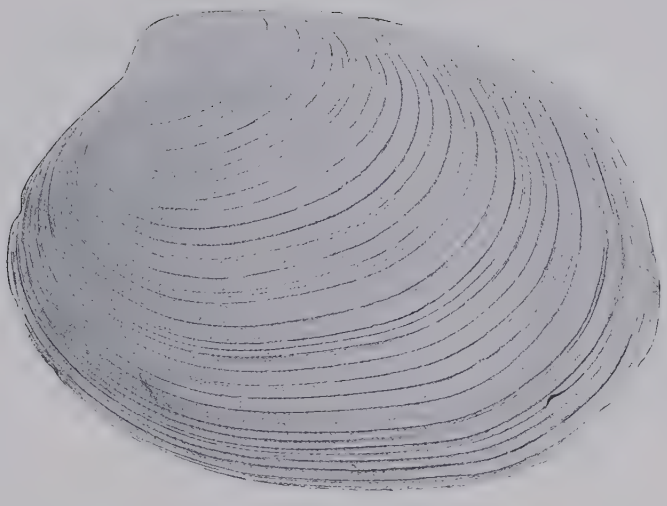

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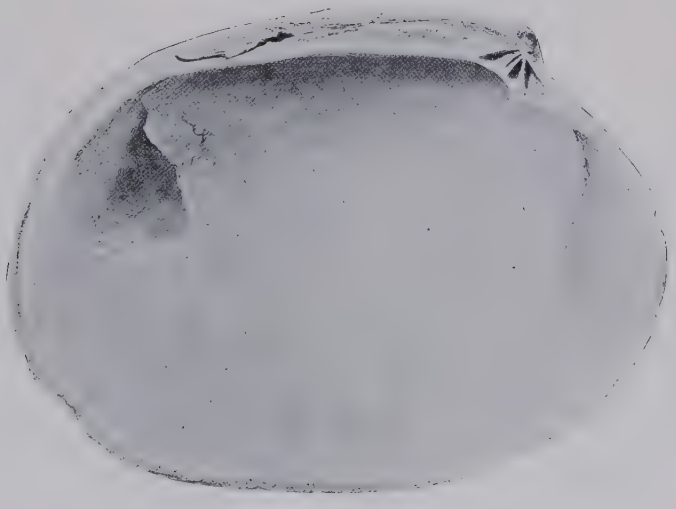


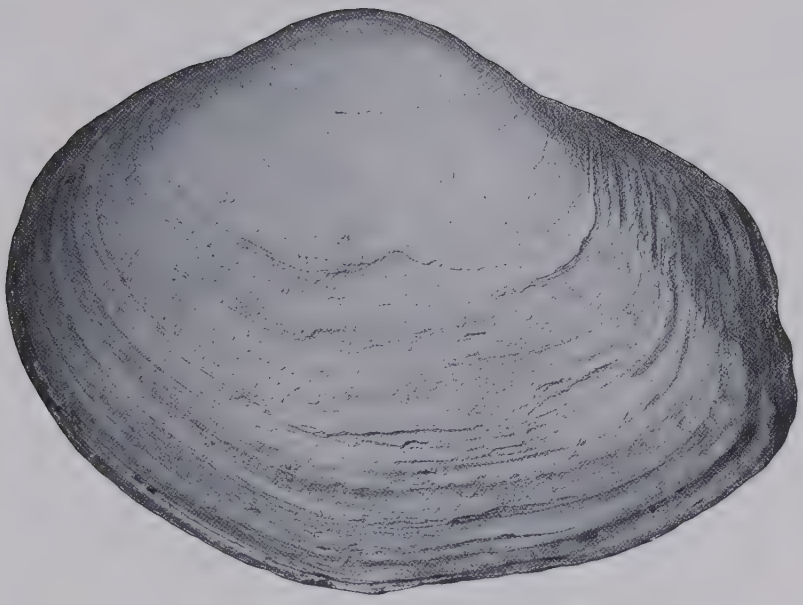
1b

PLATE 30.

Plate 31.

		Page
Figure	1a. *Schizothœrus nuttalli* Conrad	196
	1b. *Schizothœrus nuttalli* Conrad	196

This plate is from the University of California Bull. Vol. 14, Zoology.



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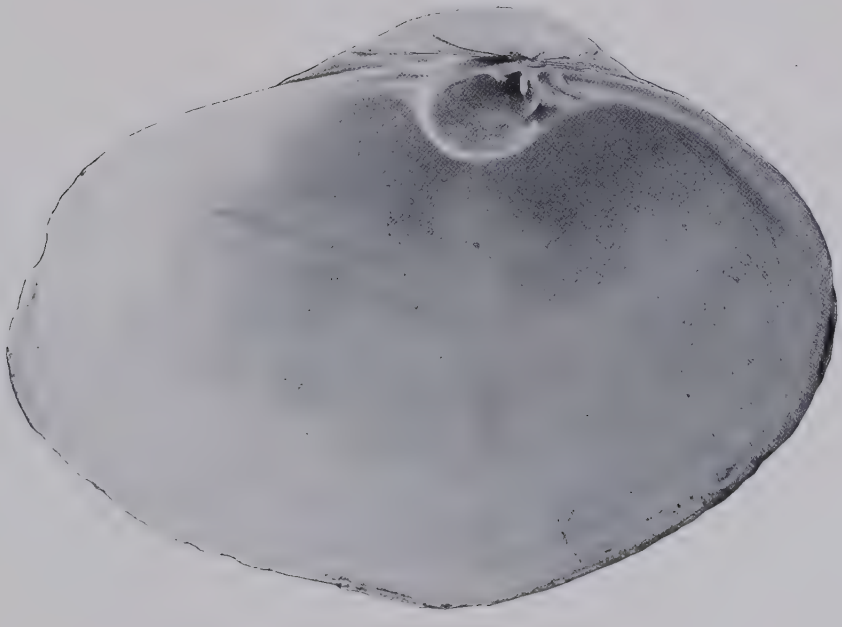

1b

PLATE 31.

PLATE 32.

		Page
FIGURE	1a. *Mya arenaria* Linnæus	198
	1b. *Mya arenaria* Linnæus	198
	2a. *Platyodon cancellatus* Conrad	202
	2b. *Platyodon cancellatus* Conrad	202

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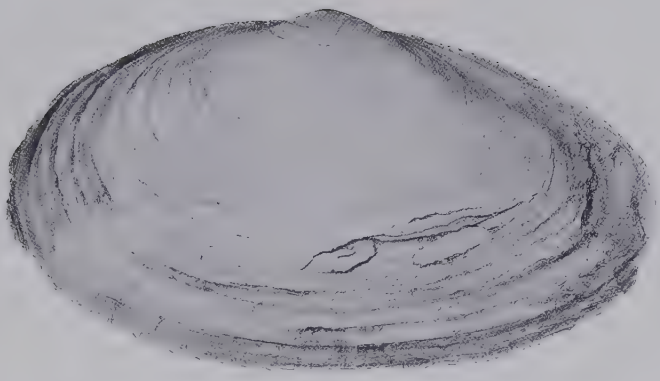

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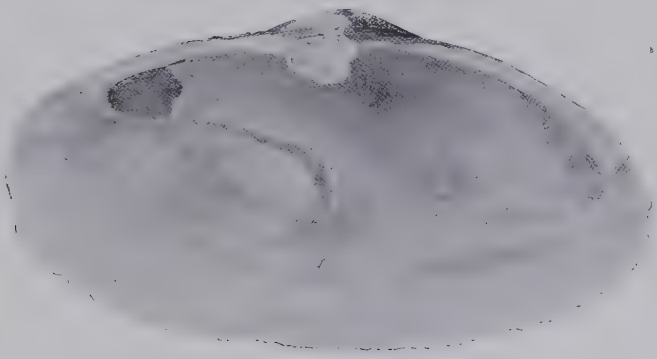

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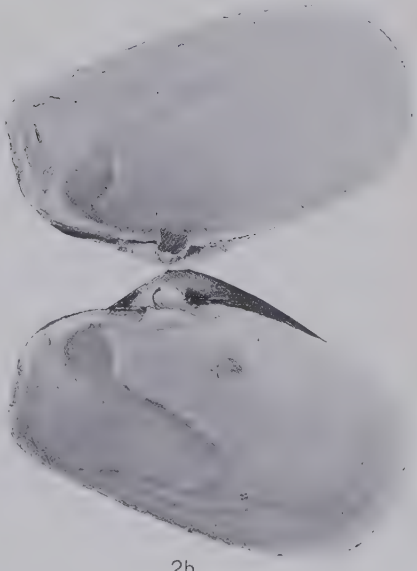

2b

PLATE 32.

PLATE 33.

		PAGE
FIGURE 1a.	*Phacoides tenuisculptus* Carpenter	128
1b.	*Phacoides tenuisculptus* Carpenter	128
2a.	*Pandora filosa* Carpenter	88
2b.	*Pandora filosa* Carpenter	88
3.	*Marcia subdiaphana* Carpenter	155
4.	*Kellia laperousii* Deshayes	131
5a.	*Phacoides annulatus* Reeve	126
5b.	*Phacoides annulatus* Reeve	126
6.	*Paphia staminea orbella* Carpenter	157

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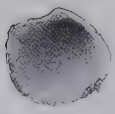

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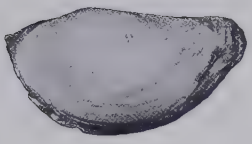

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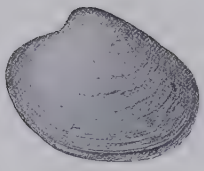

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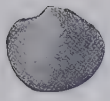

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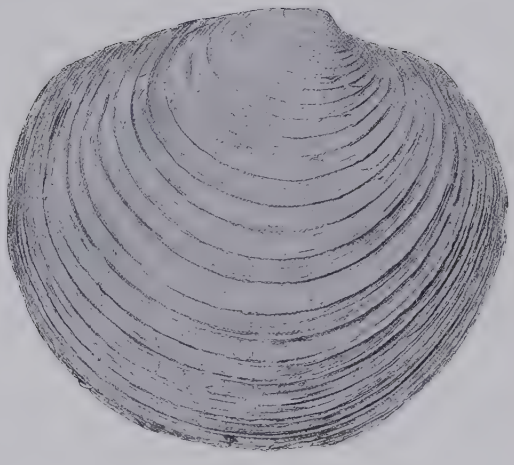

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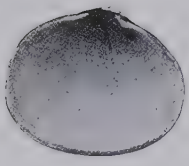

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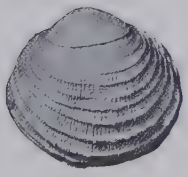

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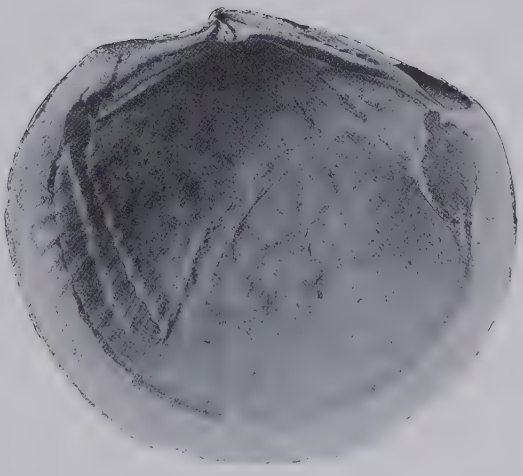

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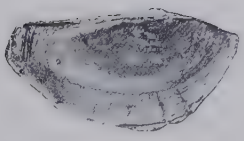

2b

PLATE 33.

Plate 34.

Figure		Page
	1a. *Cardium corbis* Martyn, X 1	142
	Station D. 5700. Dorsal view.	
	1b. *Cardium corbis* Martyn, X 1	142
	Station D. 5700. Exterior of left valve.	
	2a. *Protocardia centifilosa* Carpenter, X 1	146
	Station D. 5785. Exterior of right valve.	
	2b. *Protocardia centifilosa* Carpenter, X 1	146
	Station D. 5785. Exterior of left valve.	
	2c. *Protocardia centifilosa* Carpenter, X 1	146
	Station D. 5785. Interior of left valve.	
	2d. *Protocardia centifilosa* Carpenter, X 1	146
	Station D. 5785. Interior of right valve.	
	3. *Cuspidaria californica* Dall, X 2	101
	Station D. 5785.	
	4. *Psephidea ovalis* Dall, X 1	161
	Station 5788. Exterior of left valve.	
	5. *Thyasira gouldi* Philippi, X 4	120
	Station D. 5788. Exterior of right valve.	
	6a. *Petricola carditoides* Conrad, X 1	163
	Bolinas. Dorsal aspect.	
	6b. *Petricola carditoides* Conrad, X 1	163
	Bolinas. Exterior of left valve.	

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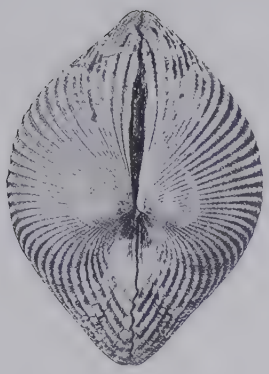
Vol. 14, Zoology.



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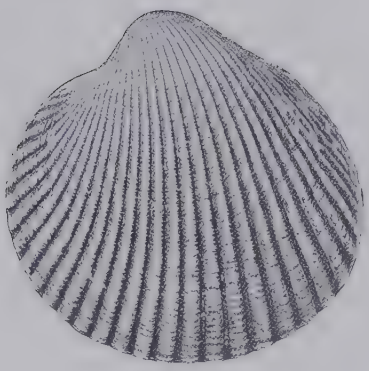

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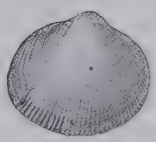

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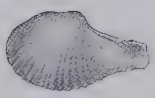

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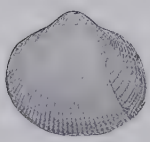

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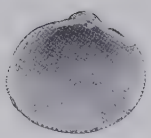

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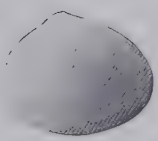

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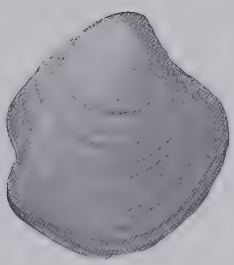

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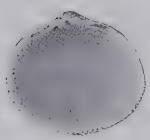

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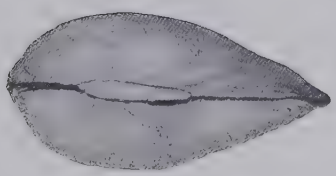

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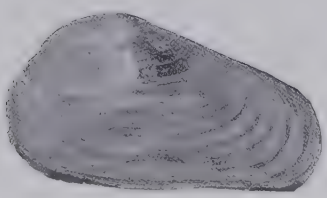


6b

PLATE 34.

PLATE 35.

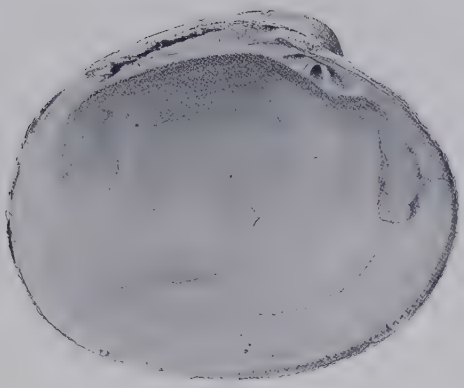
PAGE

FIGURE 1a. *Paphia staminea* Conrad 156
Interior of left valve.

1b. *Paphia staminea* Conrad 156
Exterior of left valve.

2. *Saxidomus nuttalli* Conrad 152

This plate is from the University of California Publ. Vol. 14, Zoology.



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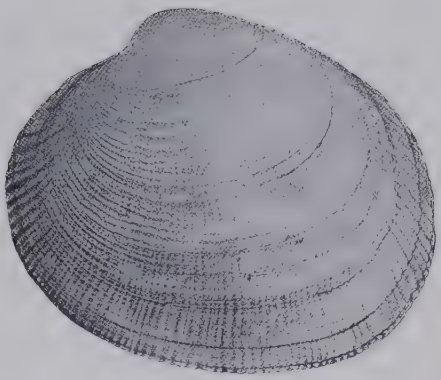

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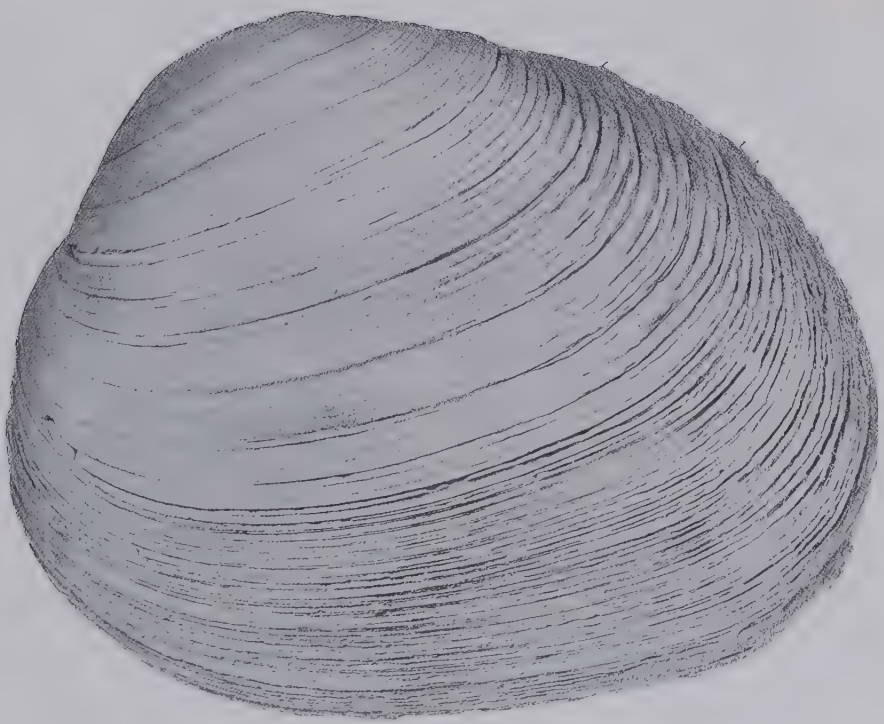

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PLATE 35.

Plate 36.

Page

Figure 1. *Zirfæa gabbi* Tryon 210
Exterior of left valve siphons extended.

2a. *Parapholas californica* Conrad 210
Ventral aspect. Moss Beach.

2b. *Parapholas californica* Conrad 210
Dorsal aspect of same specimen.

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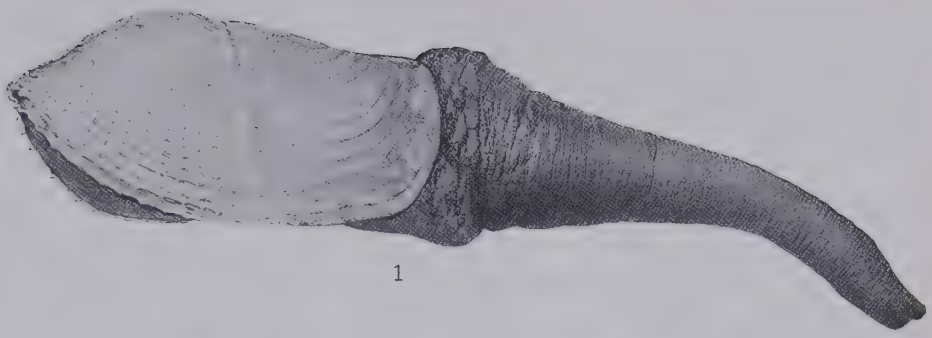


1

2a

2b

PLATE 36.

PLATE 37.

PAGE

FIGURE 1. *Nucula castrensis* Hinds 14
Station D. 5788. Exterior of left valve.

2. *Nucula castrensis* Hinds 14
Interior of right valve.

3a. *Arca transversa* Say ..... Plate 37

3b. *Arca transversa* Say ..... Plate 37
Not included in the text. 3a and 3b not found on this coast.

4. *Nucula tenuis* Carpenter 13
Station D. 5788(?). Exterior of left valve.

5. *Leda hamata* Carpenter 23
Station 5788. Exterior of left valve.

6. *Yoldia ensifera* Dall 32
Station D. 5789. Exterior of left valve.

7a. *Leda taphria* Dall, X 2 16
Station 5785. Exterior of right valve.

7b. *Leda taphria* Dall, X 2 16
Station 5785. Interior of left valve.

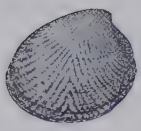
8. *Leda taphria* Dall, X 2 16
Dorsal view.

9. *Yoldia cooperi* Gabb, X 1 30
Station 57. Exterior of right valve.

10a. *Ostrea lurida* Carpenter 50
Interior of left valve.

10b. *Ostrea lurida* Carpenter 50
Interior of right valve.

This plate is from the University of California Publ. Vol. 14.



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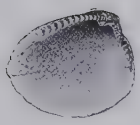

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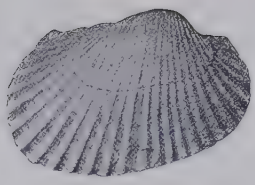

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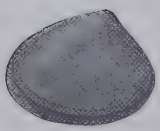

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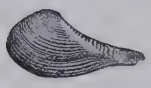

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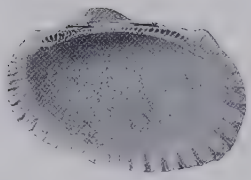

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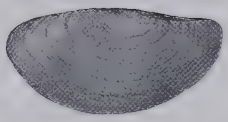

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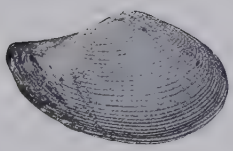

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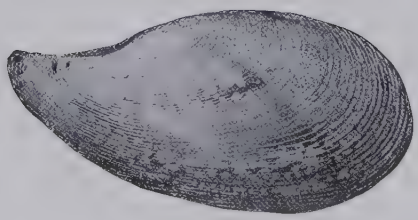

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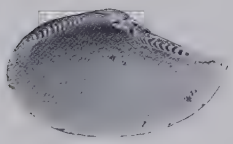

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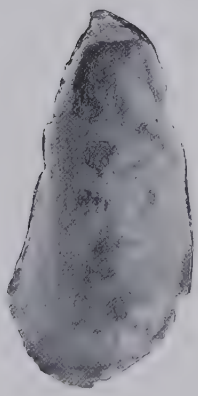

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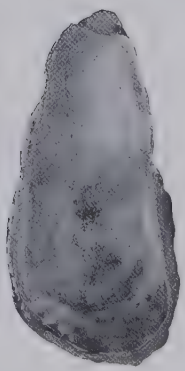


10b

PLATE 37.

Plate 38.

Page

Figure 1. *Marcia subdiaphana* Carpenter 155
Puget Sound.

2. *Terebratalia unguicula* Carpenter 226

3. *Terebratalia unguicula* Carpenter 226

4. *Terebratalia unguicula* Carpenter 226

5. *Terebratalia unguicula* Carpenter 226
2–5 Davidson's recent Brachiopods.

6. *Pecten alaskensis* Dall 62
Bull. 112, U. S. N. M.

7. *Pholadidea rostrata* Valenciennes 213
San Pedro. Magnified twice.

8. *Pseudopythina rugifera* Carpenter 136
On foot of sea mouse. Puget Sound.

9. *Pseudopythina rugifera* Carpenter 136
On Gebia pugetensis Dana, Puget Sound.

10. *Pholadidea rostrata* Valenciennes 213
San Pedro. Magnified twice.

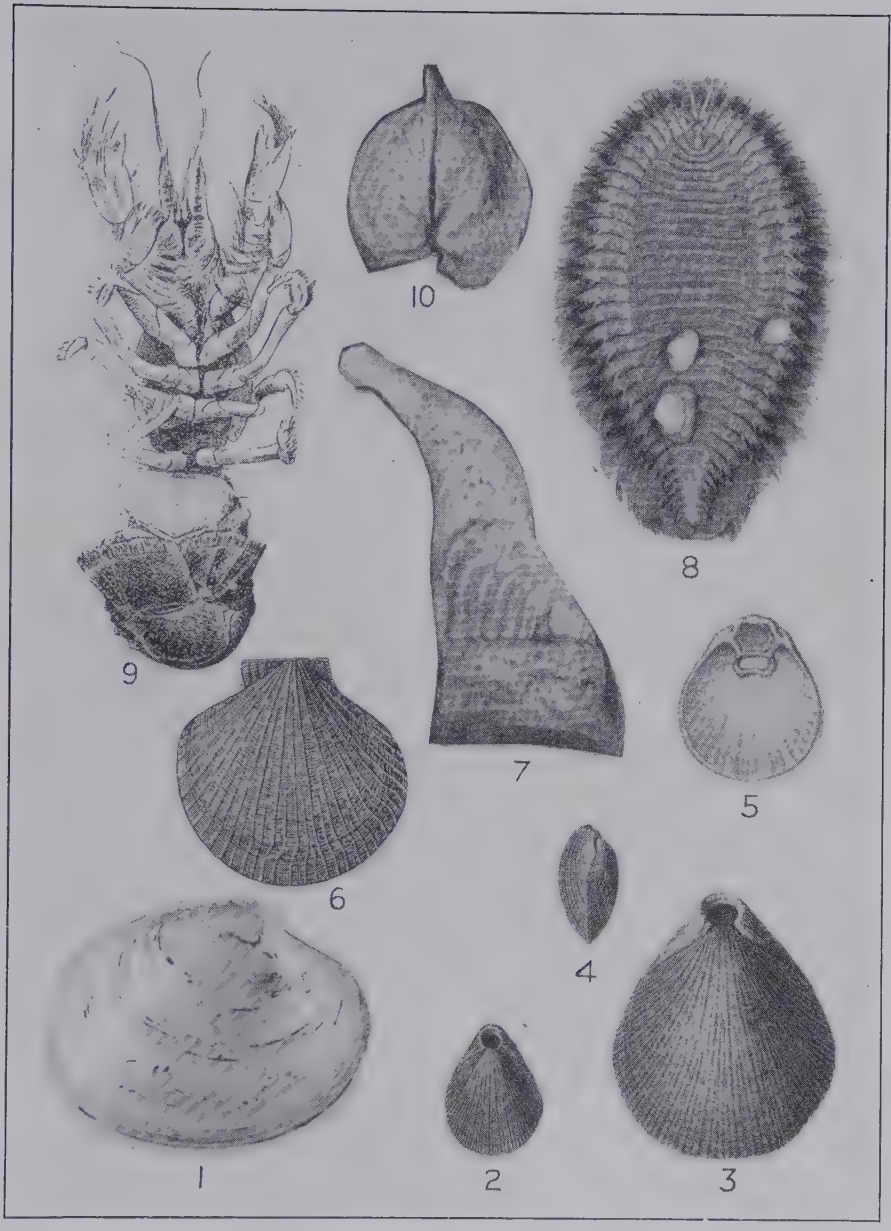


PLATE 38.

PLATE 39.

PAGE

FIGURE 1. *Leda conceptionis* Dall 21
Bull. U. S. N. M.

2. *Lithophaga aristata* Dillwyn 73
San Diego.

3. *Chione fluctifragra* Sowerby 153
San Pedro.

4. *Leda penderi* Dall 17
Memoir 14, N. Dept. of Mines, Canada.

5. *Leda penderi* Dall 17
Memoir 14, N. Dept. of Mines, Canada.

6. *Tindaria mexicana* Dall 40
Bull. Mus. Comp. Zool. 43.

7. *Tindaria mexicana* Dall 40
Bull. Mus. Comp. Zool. 43.

8. *Venerupis lamellifera* Conrad 160
San Pedro deep water.

9. *Modiolaria nigra* Gray 74
Point Barrow, Arctic.

10. *Lithophaga attenuata* Deshayes 73
Lower California.

11. *Yoldia martyria* Dall 29
Bull. No. 2, Nat. Hist. Soc., British Columbia.

12. *Poromya tenuiconcha* Dall 95
Proc. U. S. N. M., vol. 45.

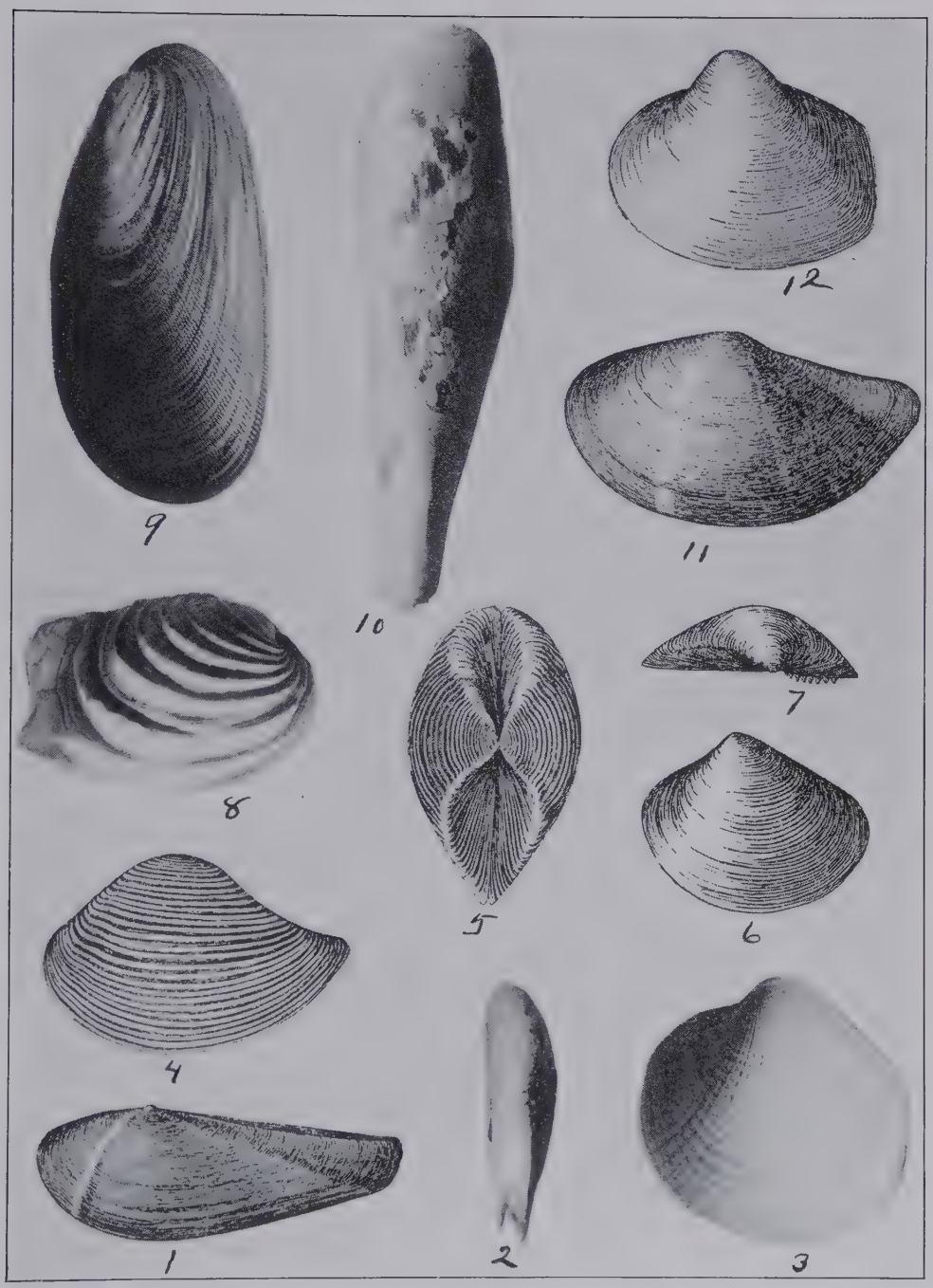


PLATE 39.

Plate 40.

Page

Figure 1. *Pecten latiauritus* var. *monotimeris* Conrad 57
Conrad's type figure. Jour. Acad. Nat. Sci., Phila., vol. 7.

2. *Pecten latiauritus monotimeris* Conrad 57
Conrad's type figure. Jour. Acad. Nat. Sci., Phila., vol. 7.

3. *Pteria sterna* Gould 48
La Paz.

4. *Leda collisoni* Dall 26
Canadian Arctic Exp., 1918.

5. *Leda collisoni* Dall 26
Canadian Arctic Exp., 1918.

6. *Periploma sulcata* Dall 83
Bull. Mus. Comp. Zool., vol. 43.

7. *Macoma oneilli* Dall 173
Sci. Res. Canadian Arctic Exp., vol. 8, pt. 20A.

8. *Glycymeris subobsoleta* Carpenter 42
Puget Sound.

9. *Glycymeris subobsoleta* Carpenter 42
Puget Sound.

10. *Solemya valvulus* Carpenter 11
Lower California.

11. *Solemya agassizii* Dall 9
Bull. Mus. Comp. Zool., vol. 43.

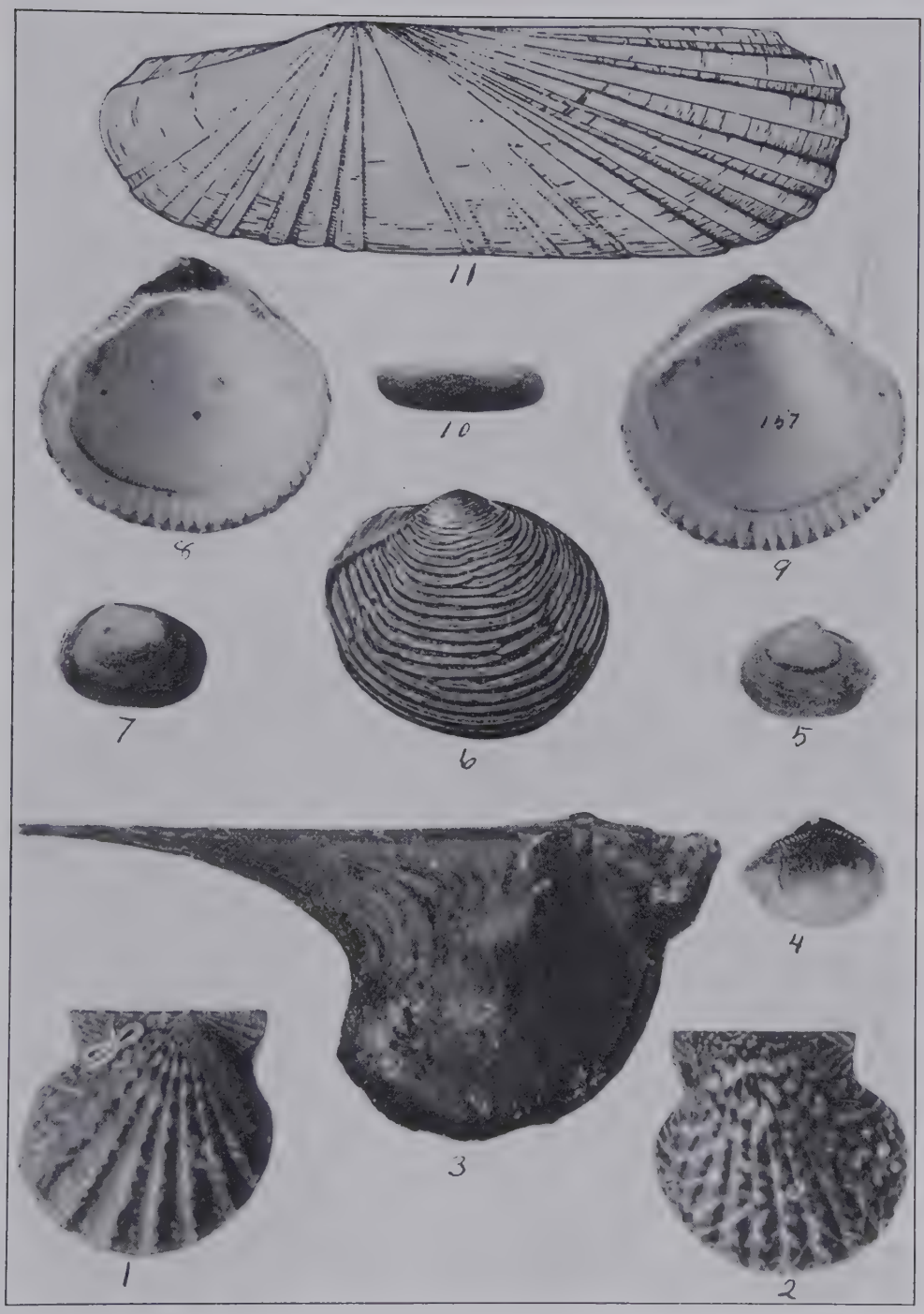


PLATE 40.

Plate 41.

		Page
Figure 1.	*Pecten islandicus beringianus* Midd. Alaska.	55
2.	*Pecten islandicus beringianus* Midd. Alaska.	55
3.	*Pecten diegensis* Dall. Off San Pedro. Deep water.	51
4.	*Pecten paucicostatus* Carpenter	56
5.	*Pecten paucicostatus* Carpenter	56

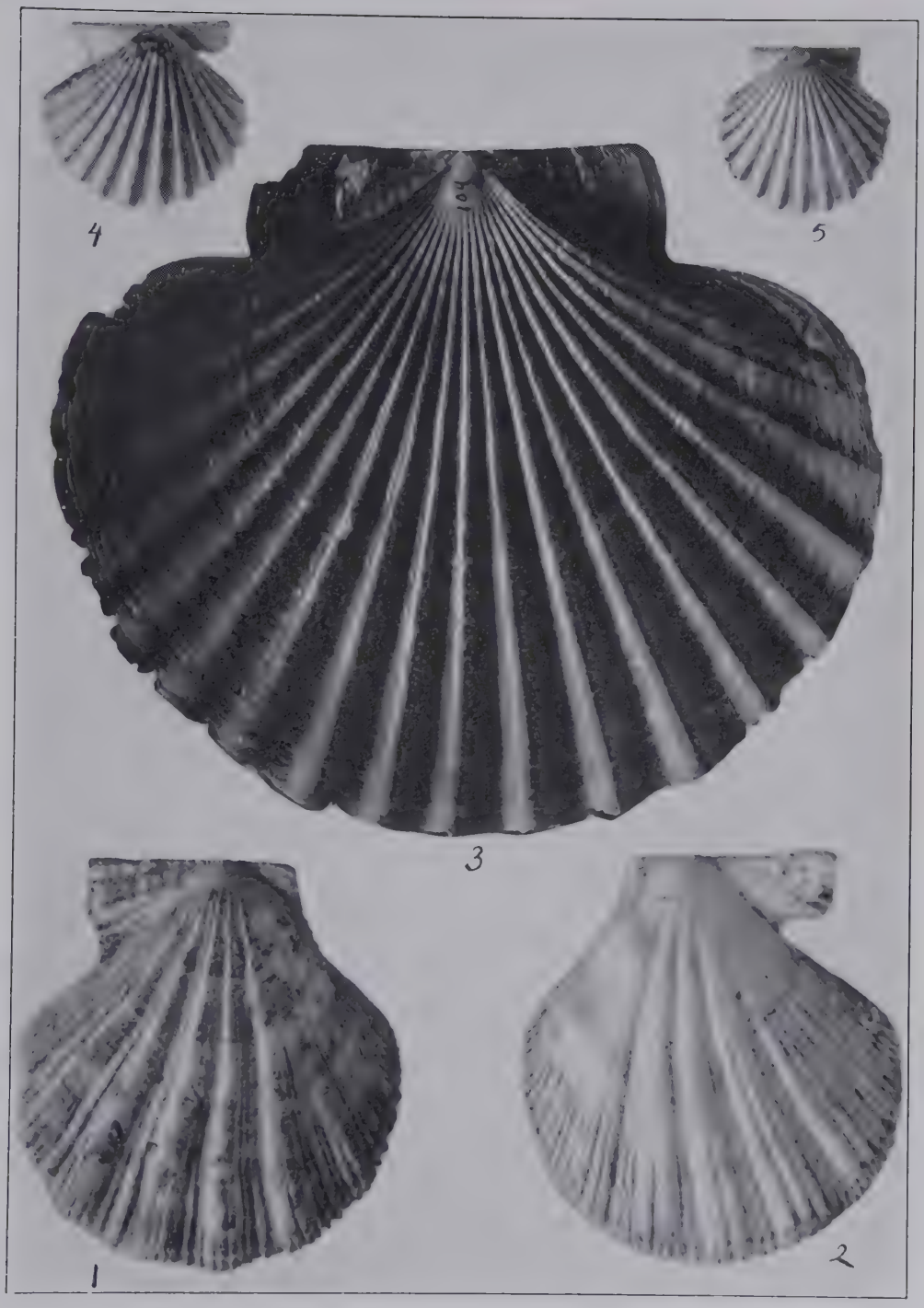


Plate 41.

Plate 42.

Page

Figure 1. *Pecten circularis æquisulcatus* Carpenter 58

Right valve, i.e., the valve having the byssal notch; exterior. Dimensions: "Altitude" is distance between the base (B) and the apex of the shell or umbo (U); "longitude" is the distance between the anterior extremity (A) and the posterior extremity (P); "diameter" is the maximum perpendicular distance from the plane of the periphery (margin or border) to the top of the arched disk, when the shell is lying interior downward; A, anterior end; P, posterior end; B, base; U, umbo; U P B A, disk; ae, anterior ear or auricle; pe, posterior ear or auricle; bn, byssal notch or sinus; ba, byssal area; ps, posterior sinus; sm, submargins or lateral areas; r, ribs; is, interspaces.

2. *Pecten circularis æquisulcatus* Carpenter 58

Right valve interior. A, P, B, and U as in figure 1; hl, hinge line; rp, resilial pit; pp, provinculum; cc, cardinal crura; bn, byssal notch; cm, ctenolium; as, adductor scar.

3. *Pandora glacialis* Leach, 1819 89

Jour. Acad. Nat. Sci., Phila., vol. 7.

4. *Pandora glacialis* Leach 89

5. *Macoma calcarea* Gmelin 173

Puget Sound.

6. *Macoma brota lipara* Dall 171

Puget Sound.

7. *Pholadidea darwinii* Sowerby 213

This is figured as our species has been called this.

8. *Pholadidea darwinii* Sowerby 213

9. *Macoma inquinata* Deshayes 172

Puget Sound.

10. *Macoma incongrua* Martens 170

Puget Sound.

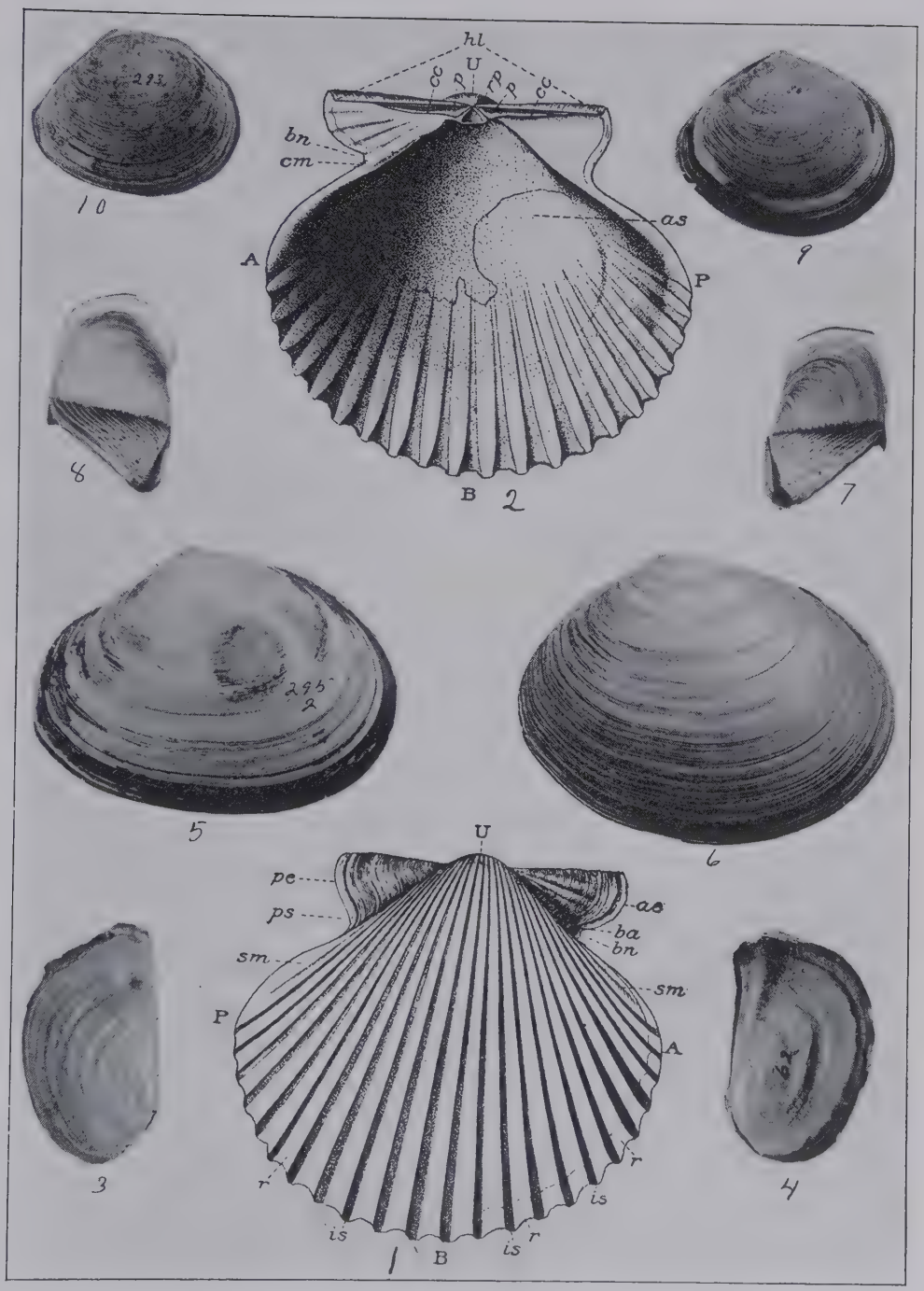


PLATE 42.

Plate 43.

Page

Figure 1. *Periploma discus* Stearns 82
Long Beach.
Proc. U. S. N. M., vol. 13.

2. *Tindaria gibbsi* Dall 40
Bull. Nat. Hist. Soc., British Columbia, No. 2.

3. *Periploma discus* Stearns 82
Long Beach.
Proc. U. S. N. M., vol. 13.

4. *Thracia beringi* Dall 85
Proc. U. S. N. M., vol. 49.

5. *Psammobia californica* Conrad 185
Conrad's type figure.
Proc. Acad. Nat. Sci., Phila., vol. 7.

6. *Thracia curta* Conrad 84
San Pedro.

7. *Thracia challisiana* Dall 84
Puget Sound.

8. *Thracia trapezoides* Gabb 84
Puget Sound.

9. *Venericardia barbarensis* Stearns 111
Proc. U. S. N. M., vol. 13.

10. *Semele rubropicta* Dall 180
Amer. Journ. Conch., vol. 7.

11. *Venericardia barbarensis* Stearns 111
Proc. U. S. N. M., vol. 13.

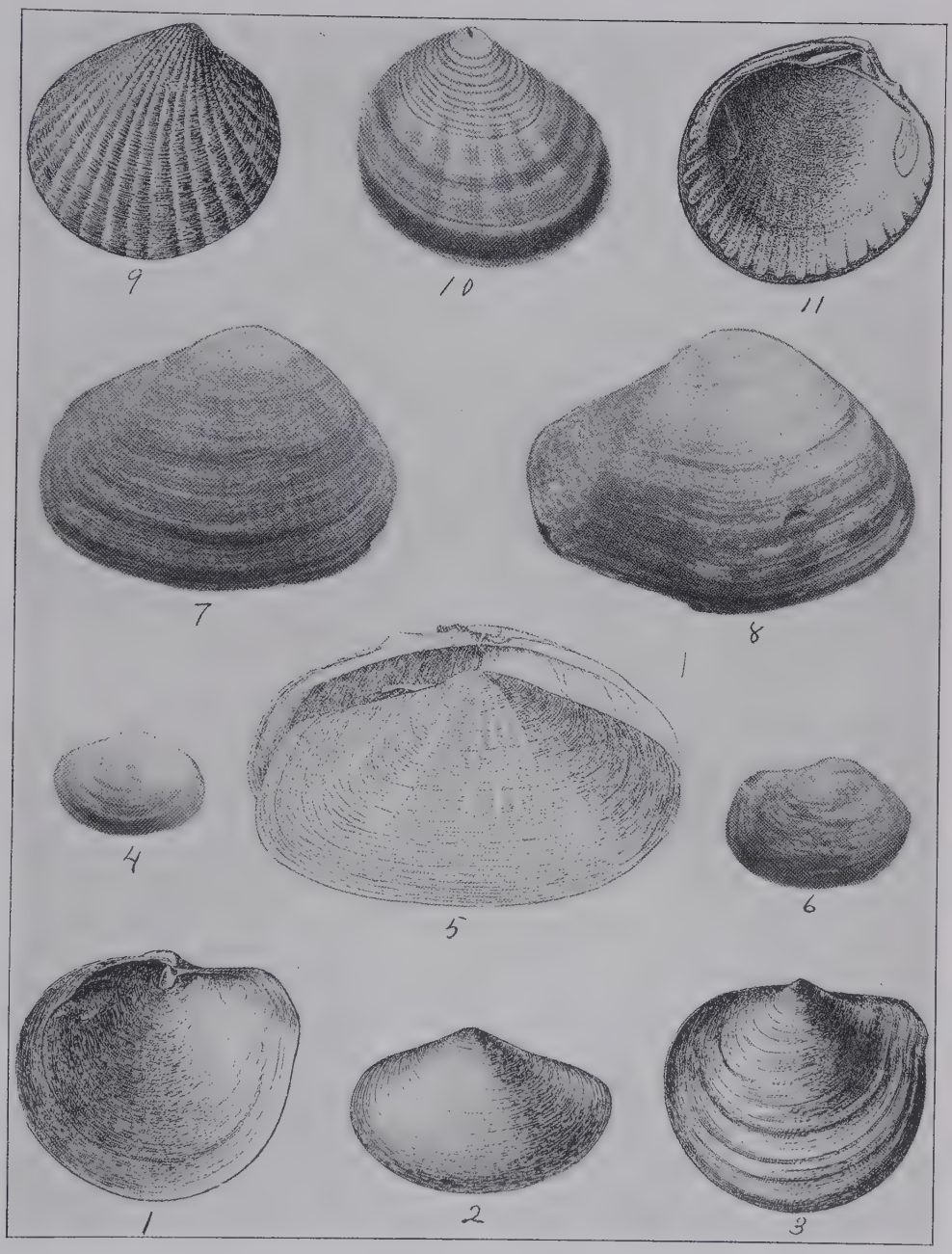


PLATE 43

Plate 44.

Page

Figure 1. *Macoma balthica* Linnæus 172
Station D. 5717. Exterior of right valve.

2. *Macoma balthica* Linnæus 172
Station D. 5717.

3a. *Tellina salmonea* Carpenter 165
Station D. 5800.
Exterior of right valve.

3b. *Tellina salmonea* Carpenter 165
Station D. 5800. Exterior of left valve.

4. *Macoma indentata* Carpenter 178
Station D. 4791. Exterior of right valve.

5. *Tellina bodegensis* Hinds 168
Bolinas. Exterior of left valve.

6. *Macoma yoldiformis* Carpenter 177
Station D. 5785. Exterior of left valve.

7a. *Tellina buttoni* Dall 167
Station D. 5739. Exterior of right valve.

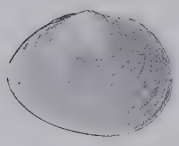
7b. *Tellina buttoni* Dall 167
Station D. 5739. Interior of right valve.

8. *Macoma secta* Conrad 178
Bolinas. Exterior of left valve.

9. *Macoma balthica* Linnæus 172
Near Key Route Pier, Oakland. Exterior of left valve.

10a. *Tellina carpenteri* Dall 166
Station D. 5788. Interior of left valve.

10b. *Tellina carpenteri* Dall 166
Station D. 5788. Exterior of left valve.



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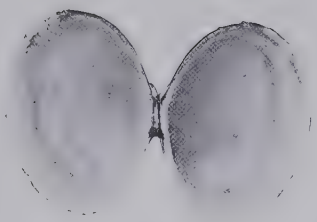

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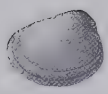

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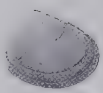

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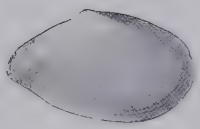

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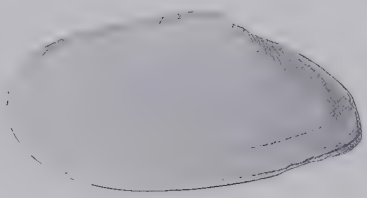

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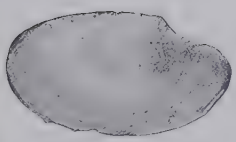

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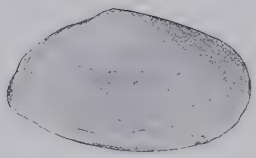

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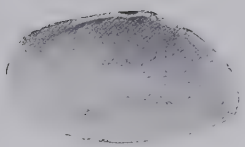

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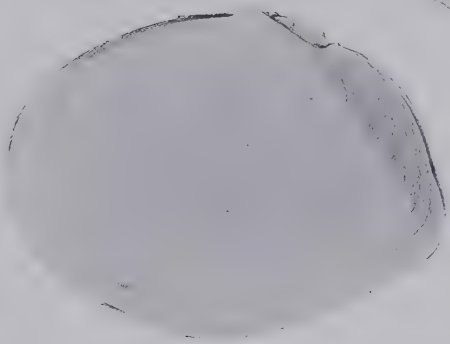

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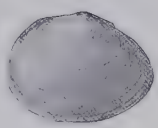

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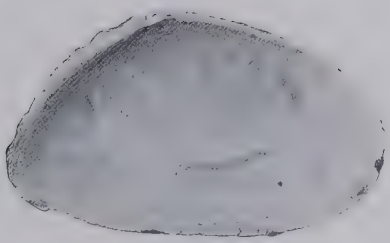

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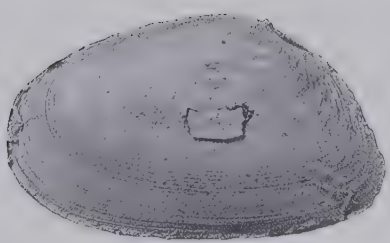

10b

PLATE 44.

Plate 45.

Figure.		Page
	1a. *Macoma nasuta* Conrad. Station 5830. Exterior of right valve.	174
	1b. *Macoma nasuta* Conrad. Station 5830. Exterior of left valve.	174
	1c. *Macoma nasuta* Conrad. Station 5830. Interior of left valve.	174
	1d. *Macoma nasuta* Conrad. Station 5830. Interior of right valve.	174
	2a. *Macoma inquinata* Deshayes. Exterior of right valve.	172
	2b. *Macoma inquinata* Deshayes. Interior of right valve.	172
	3a. *Macoma inquinata* Deshayes. Exterior of left valve.	172
	3b. *Macoma inquinata* Deshayes. Interior of left valve.	172

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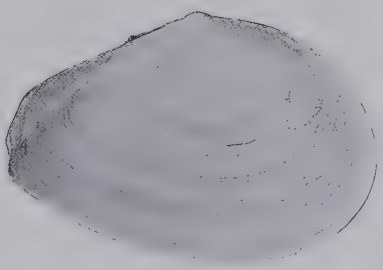

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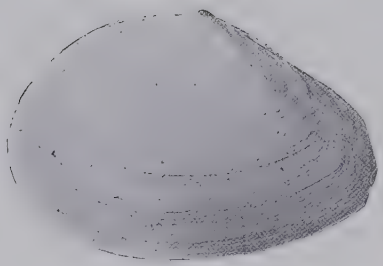

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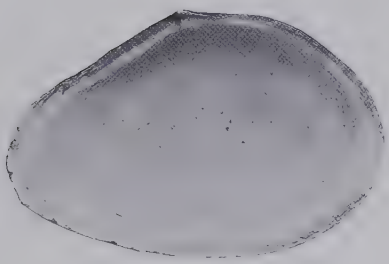

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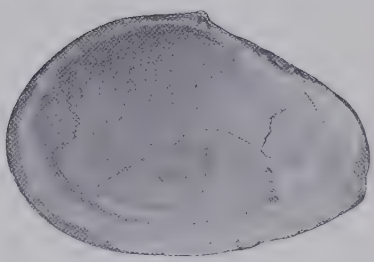

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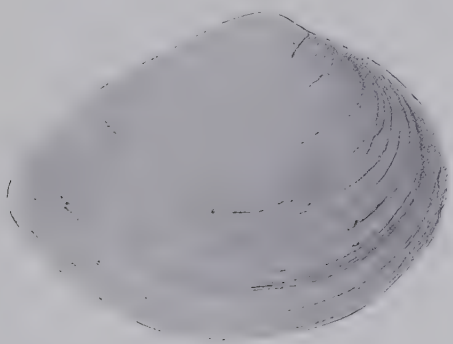

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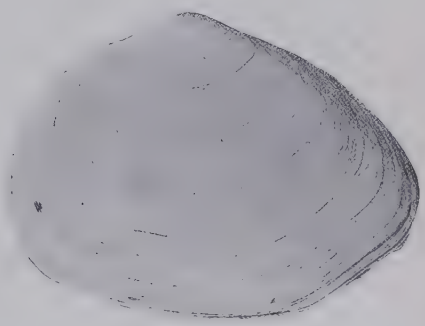

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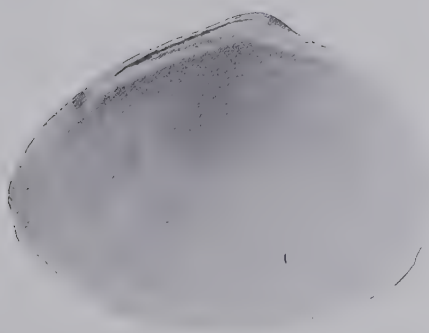

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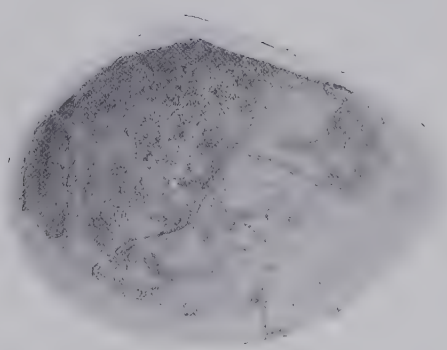

2b

PLATE 45.

PLATE 46.

PAGE

Spisula hemphilli Dall.....194

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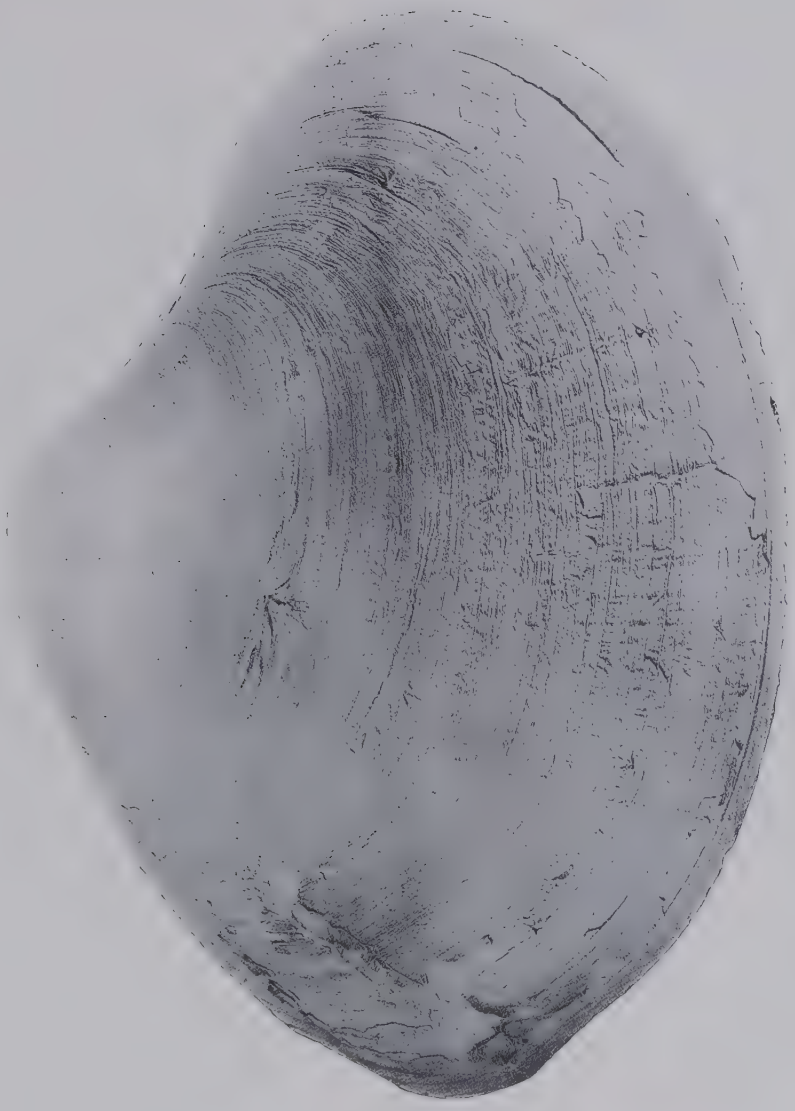

PLATE 46.

Plate 47.

Page

Figure 1. *Siliqua patula alta* Broderip & Sowerby.....190
Natural size.
Swikshak Beach, Alaska.

2. *Siliqua patula alta* Broderip & Sowerby.....190
Swikshak Beach, Alaska.

Plate 47.

PLATE 48.

PAGE

FIGURE 1. *Siliqua patula* Dixson 190

Reduced slightly.

Swikshak Beach, Alaska.

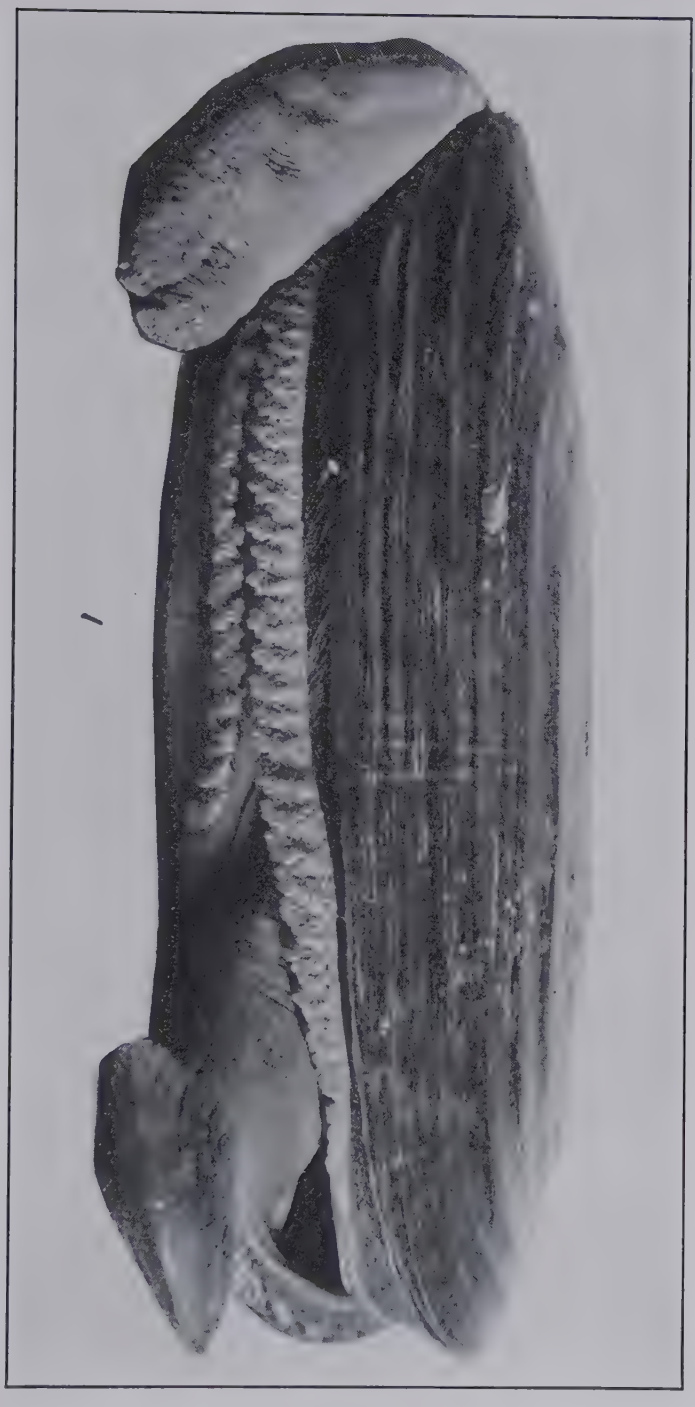

PLATE 48.

Plate 49.

Page

Figure 1. *Solen sicarius* Gould.....188
Puget Sound.

2. *Platidea seminula radiata* Dall.....
200 fathoms off San Pedro.

3. *Glottida albida* Hinds.....
San Pedro.

4. *Discinia strigata* Broderip.....
Guatemala. Enlarged.

5. *Discinia strigata* Broderip.....
Guatemala. Type specimen.

6. *Ensis californicus* Dall.....189
San Pedro.

7. *Dendrophyllia oldroydi* n. sp.....(Faustina MS.)
200 fathoms off San Pedro.
With Platidea seminula radiata Dall living on it.

8. *Donax gouldi* Dall.....183
Gould's type figure of Donax obesus.

9. *Donax gouldi* Dall.....183
Gould's type figure.

PLATE 49.

Plate 50.

Page

Spisula hemphilli Dall 194

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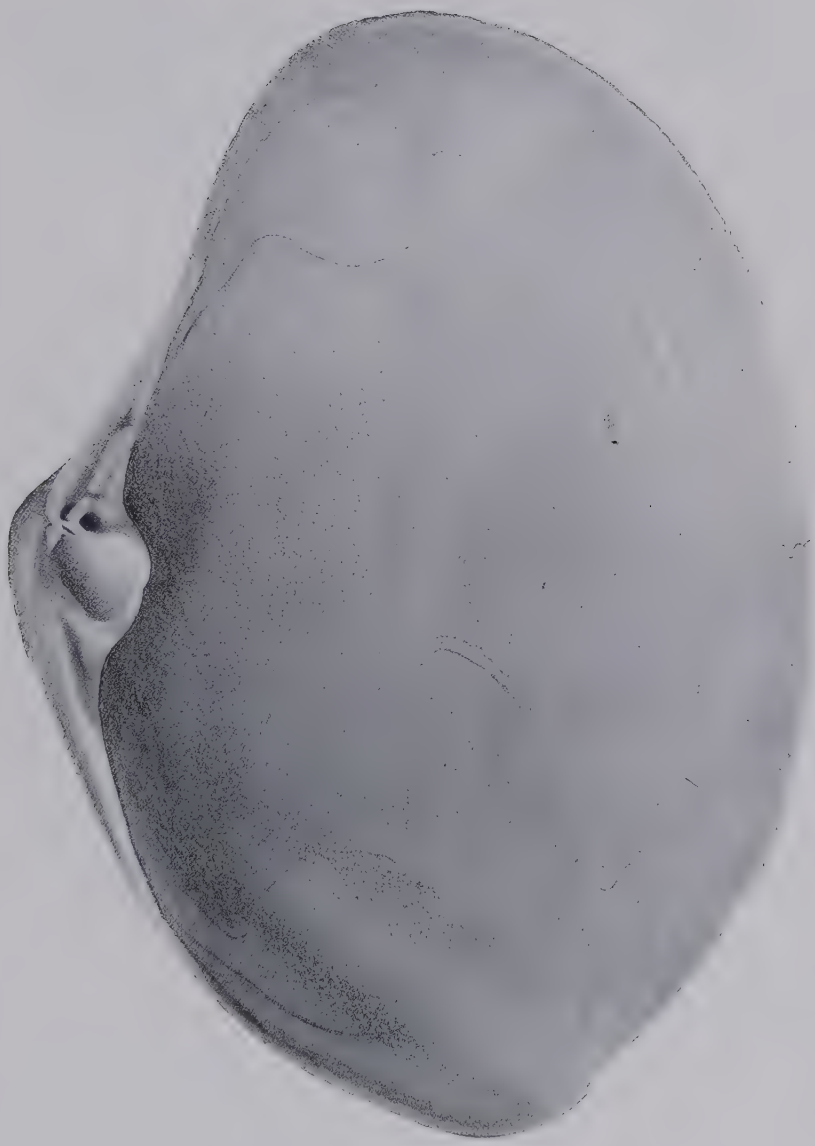

PLATE 50.

Plate 51.

Page

Figure 1a. *Pholadidea ovoidea* Gould 212
Bolinas. Exterior of left valve showing siphons extended.

1b. *Pholadidea ovoidea* Gould 212
Dorsal view showing siphons extended.

2a. *Pholadidea ovoidea* Gould 212
Ventral view of an immature specimen.

2b. *Pholadidea ovoidea* Gould 212
View of left valve of same specimen.

3a. *Pholadidea penita* Conrad 211
Bolinas. Exterior of left valve showing siphons extended.

3b. *Pholadidea penita* Conrad 211
Dorsal view.

4. *Saxicava arctica* Linnæus 208
Exterior of left valve.

5. *Saxicava pholadis* Linnæus 209
Goat Island, San Francisco.
Exterior of left valve.
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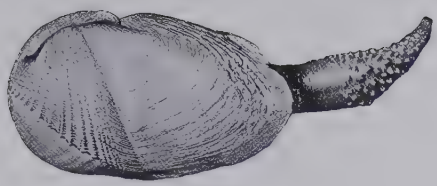

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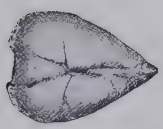

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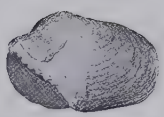

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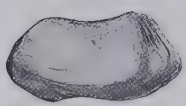

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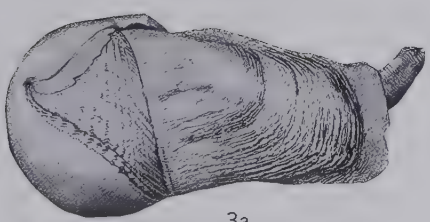

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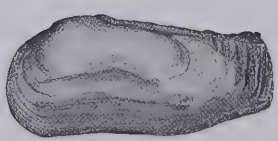

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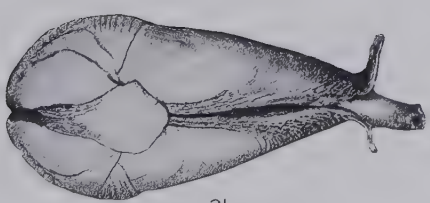


3b

PLATE 51.

PLATE 52.

PAGE

FIGURE 1. *Siliqua patula* Dixon 190
Swikshak Beach, Alaska.
Reduced a little.

2. *Siliqua lucida* Conrad 189
San Diego.

PLATE 52.

Plate 53.

		Page
Figure 1.	*Macoma middendorffii* Dall. Bering Sea.	170
2.	*Astarte rollandi* Bernardi. Alaska.	105
3.	*Thyasira barbarensis* Dall. San Diego.	120
4.	*Pandora forresterensis* Willett. Forrester Island.	90
5.	*Pandora forresterensis* Willett. Forrester Island.	90
6.	*Pandora punctata* Conrad. San Diego.	90
7.	*Pandora punctata* Conrad. San Diego.	90
8.	*Pandora bilirata* Conrad. Alaska.	89
9.	*Pandora bilirata* Conrad. Alaska.	89

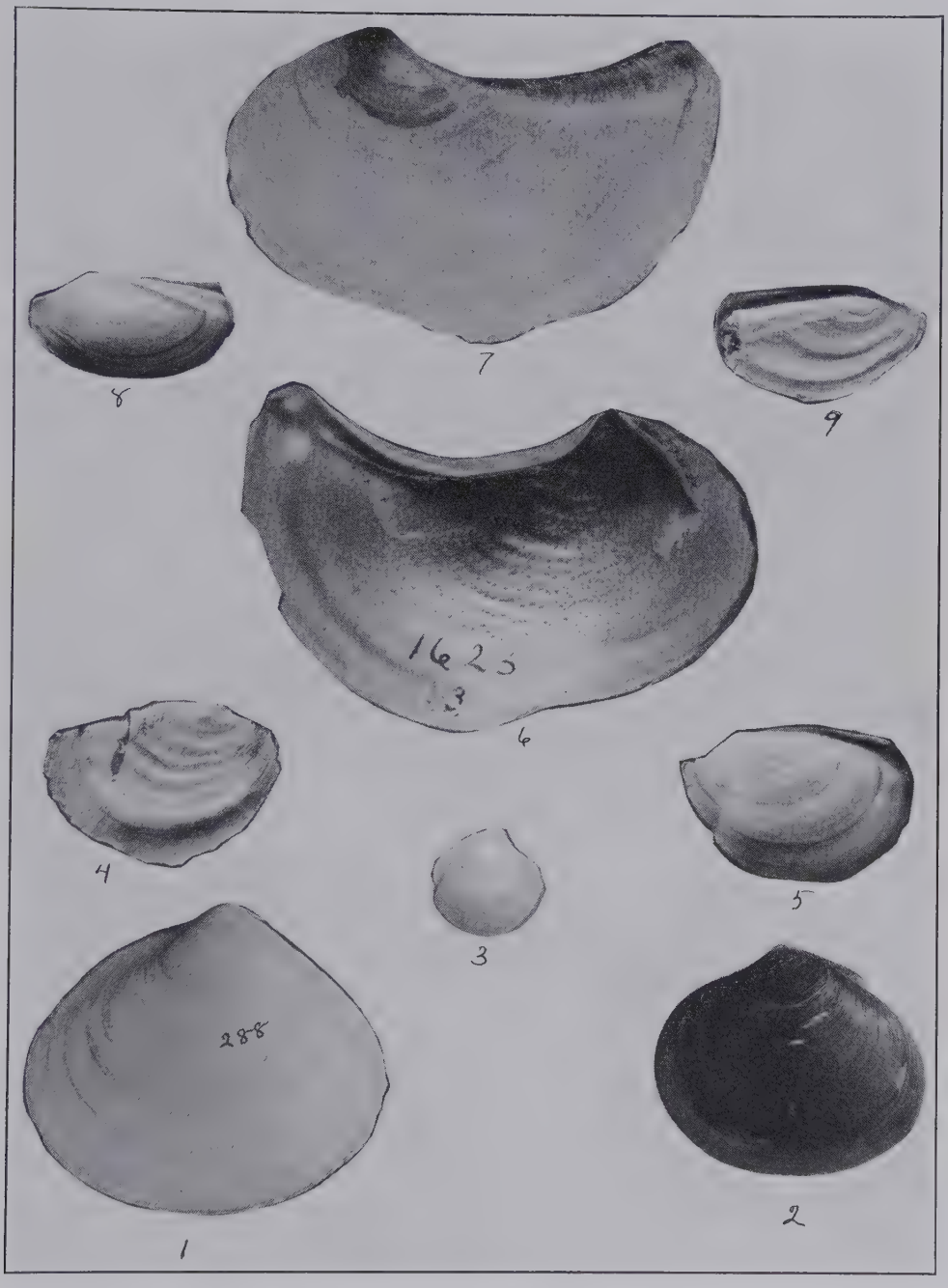
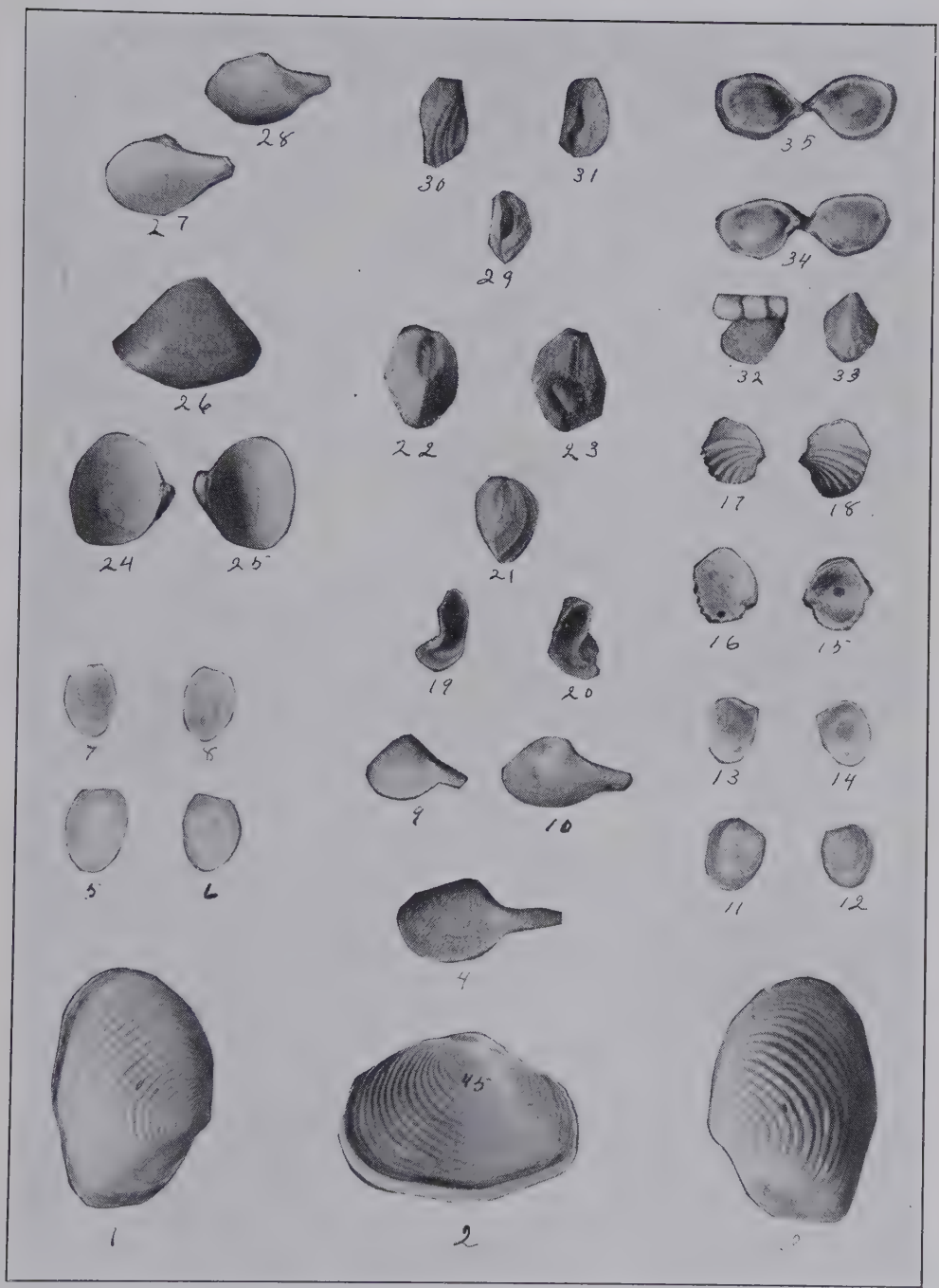


PLATE 53.

Plate 54.

Page

Figure 1. *Cyathodonta pedroana* Dall 86
2. *Cyathodonta pedroana* Dall 86
3. *Cyathodonta pedroana* Dall 86
San Diego.
4. *Leiomya scabra* Carpenter 103
Puget Sound.
5. *Serridens oblonga* Carpenter 135
6. *Serridens oblonga* Carpenter 135
7. *Serridens oblonga* Carpenter 135
8. *Serridens oblonga* Carpenter 135
Puget Sound.
9. *Cuspidaria striata* Jeffreys ..... (figured only)
10. *Cuspidaria striata* Jeffreys ..... (figured only)
San Pedro. Figured only.
11. *Rochefortia tumida* Carpenter 132
12. *Rochefortia tumida* Carpenter 132
13. *Rochefortia tumida* Carpenter 132
14. *Rochefortia tumida* Carpenter 132
15. *Verticordia ornata* Orbigny 103
16. *Verticordia ornata* Orbigny 103
17. *Verticordia ornata* Orbigny 103
18. *Verticordia ornata* Orbigny 103
San Pedro.
19. *Milneria kelseyi* Dall 117
20. *Milneria kelseyi* Dall 117
21. *Milneria kelseyi* Dall 117
22. *Milneria kelseyi* Dall 117
23. *Milneria kelseyi* Dall 117
San Pedro.
24. *Poromya tenuiconcha* Dall 95
25. *Poromya tenuiconcha* Dall 95
26. *Poromya tenuiconcha* Dall 95
Alaska.
27. *Cuspidaria glacialis* G. O. Sars 98
28. *Cuspidaria glacialis* G. O. Sars 98
Bering Sea.
29. *Milneria minima* Dall 117
30. *Milneria minima* Dall 117
31. *Milneria minima* Dall 117
San Pedro.
32. *Phylobrya setosa* Carpenter 49
33. *Phylobrya setosa* Carpenter 49
34. *Phylobrya setosa* Carpenter 49
35. *Phylobrya setosa* Carpenter 49
San Pedro.


28
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30
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20
7
8
13
14
9
10
5
6
11
12
4
1
2
3

PLATE 54.

PLATE 55.

		PAGE
FIGURE 1.	*Sanguinolaria nuttallii* Conrad. San Pedro.	185
2.	*Chione undatella* Sowerby. Lower California.	154
3.	*Antigona fordi* Yates. Long Beach.	152
4.	*Sanguinolaria nuttallii* Conrad. San Pedro.	185

PLATE 55.

PLATE 56.

PAGE

FIGURE 1. *Amiantis callosa* Conrad.....151
Long Beach.

2. *Amiantis callosa* Conrad.....151
Long Beach.

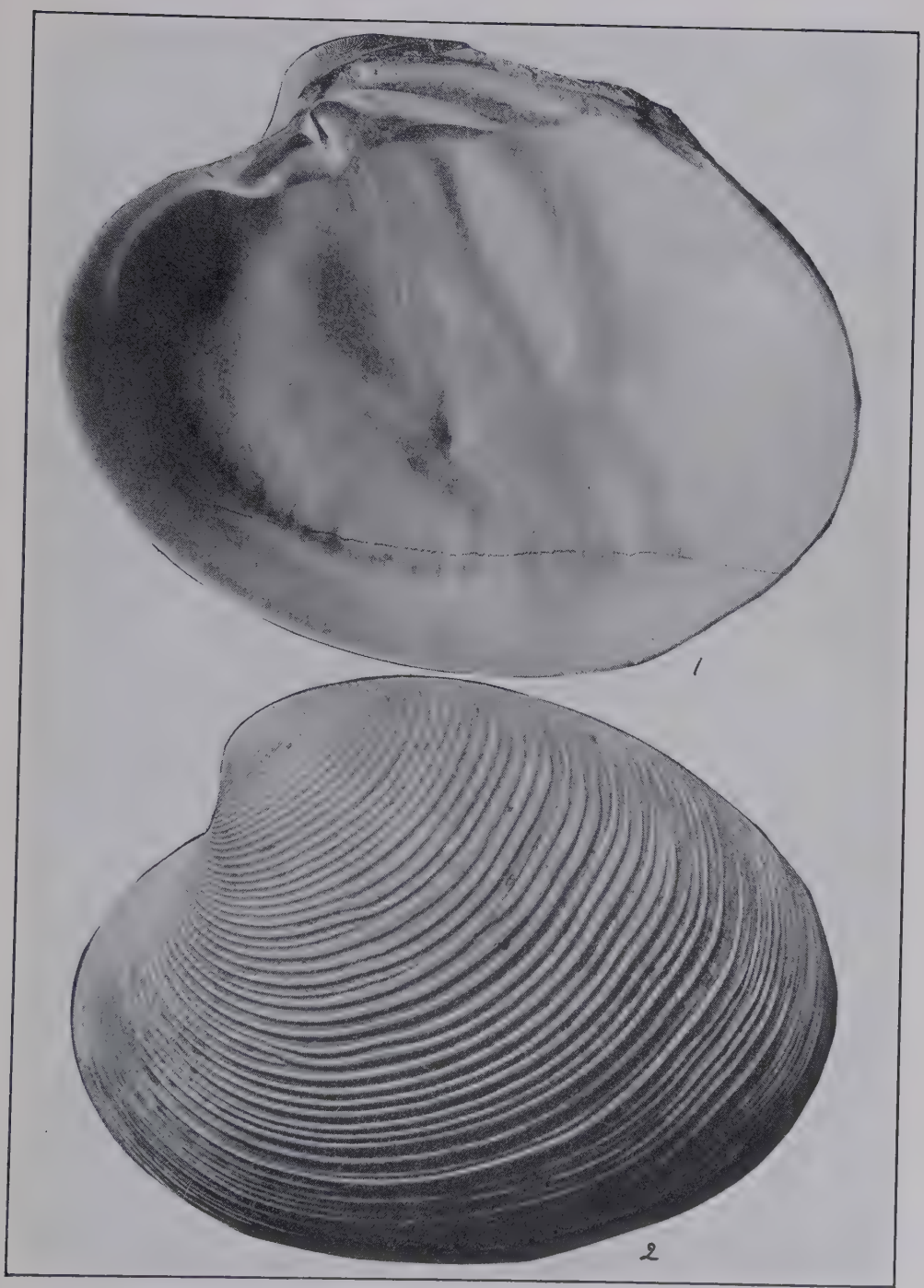


PLATE 56.

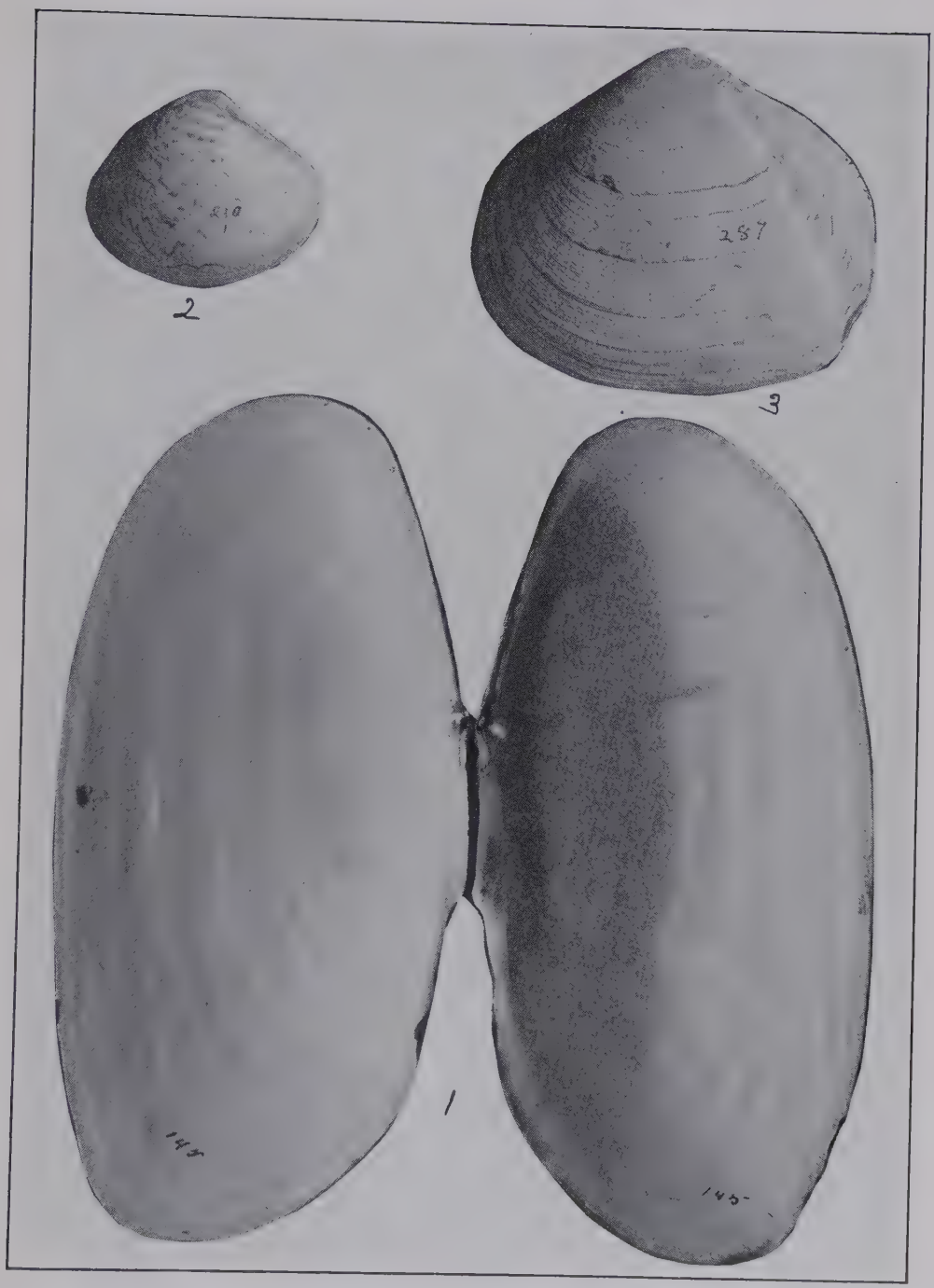
PLATE 57.

PAGE

FIGURE 1. *Psammobia edentula* Gabb.....185
Off San Pedro, 25 fathoms.

2. *Pitaria newcombiana* Gabb.....151
San Pedro.

3. *Metis alta* Conrad.....169
San Pedro.



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